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VOL. XIX, NO. 10

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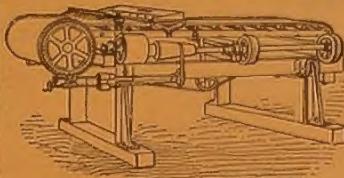
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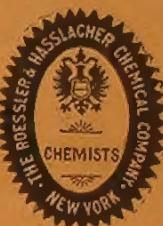
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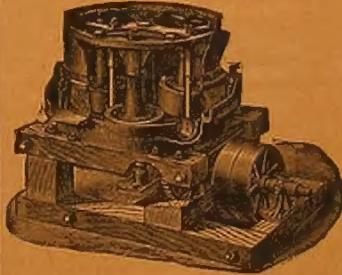
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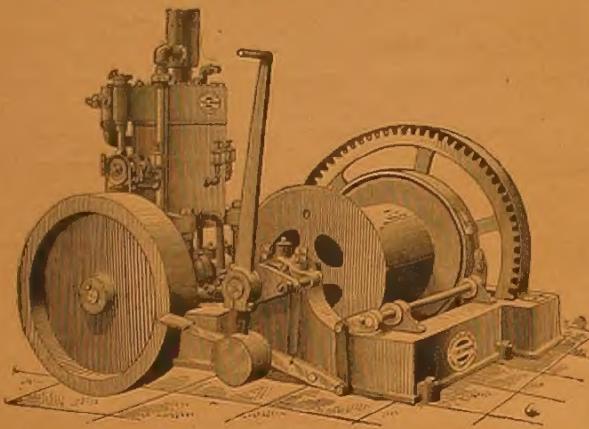
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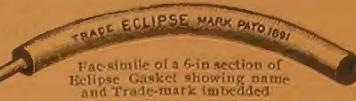
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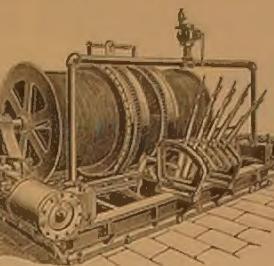
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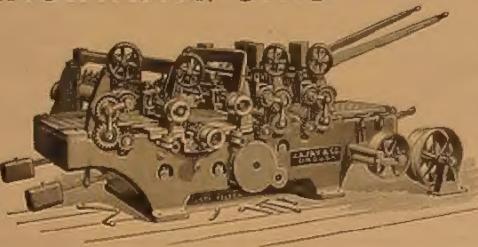
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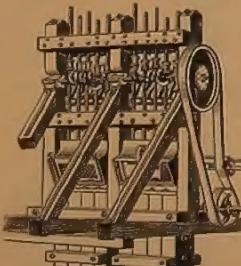
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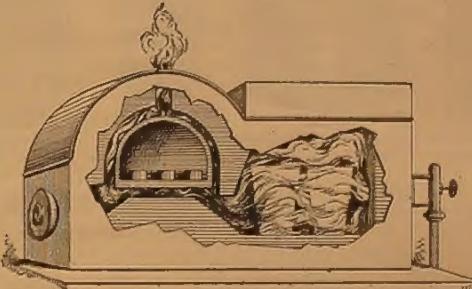
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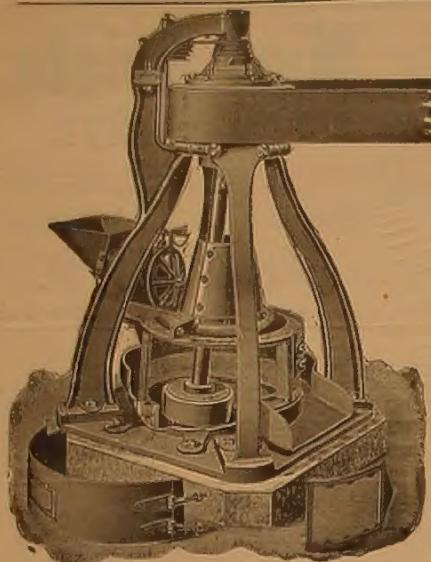
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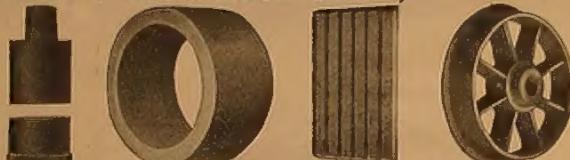
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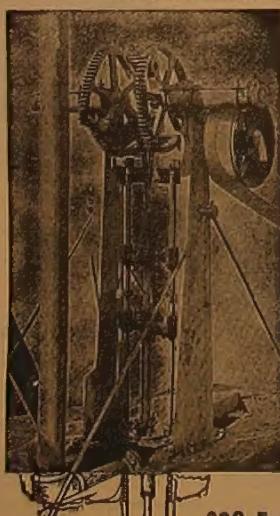
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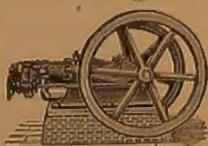


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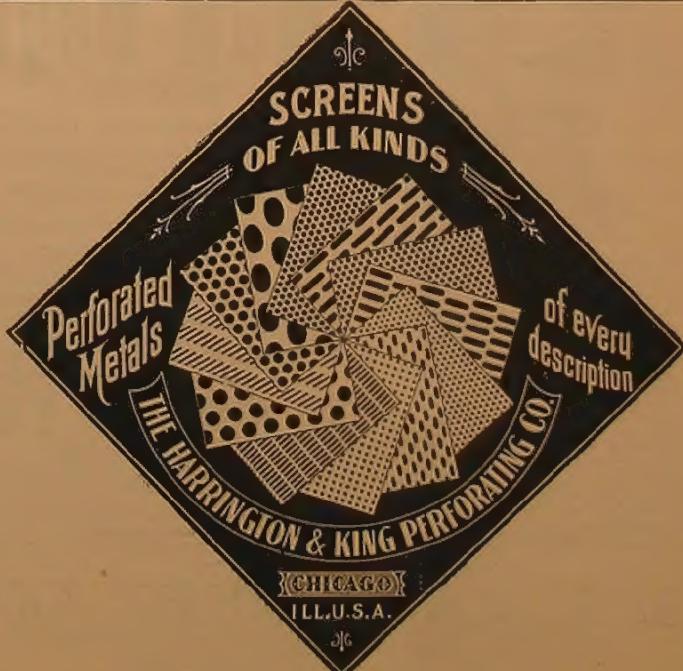


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Sulphur, in the native but impure condition, is one of the non-metallic mineral products of the Western States which the present war with Spain has brought into importance, as the price has advanced from \$20 a ton to \$35 and \$45 a ton in New York for brimstone. The attention of prospectors is called to this fact, and in one instance has been taken advantage of to supply the local demand for sulphuric acid, for the manufacture of artificial fertilizers in Los Angeles. A deposit of native sulphur, located on the old Pio Pico Rancho, two miles west of Whittier on the road to Los Angeles, and about twelve miles from this city, is being opened. The deposit is found at the foot of a hill close to the road and east of the reservoir at Aliso Canyon, in rocks of cretaceous age. The present extent of the exposure shows on the surface for a distance of 25 by 100 feet so far as exposed. As other deposits of sulphur have been found in the California coast range, they may be operated at present rates to compete with the imported article from Japan and the Gulf of Mexico. Although the demand on this coast is small, it is highly desirable that manufacturers of oil and acid for fertilizers should do all in their power to purchase supplies at home, as every new deposit opened means increased trade in the district, and, indirectly to themselves, with a possible supply at lower cost.

LEASING MINERALS.

The parties advocating the government ownership of minerals, and those who are in favor of individual ownership have both to acknowledge that the leasing of minerals is a plan for working them which works well under both systems. The difference between the two plans of operating is that under government control the leasing is done by areas or mines, and may be classed as a wholesale branch, while under the individual proprietor mines and works are leased as a whole, and often subleases are let to the workmen. In the eastern states the system is largely practiced of leasing to miners as well as more recently in the west has the tributary system of the Cornish miner come to be in favor both with the employer and the miner. It allows of individual energy and ability to work, the fullest chance for expansion and gain. In contrast with the company account, or days' wages plan, where leasing is possible will the

best results to both parties be obtained. Less supervision is required, and the miner becomes a partner in the interest he has in the increased output he may produce. Whether in the wholesale or retail plan of leasing minerals, the good object is accomplished that in the event of one operator becoming incapacitated to work, a chance is given to a new party to operate the vacated ground. Under individual ownership this is not always the case, for the heirs are not always disposed to work the property, and resort is either made to leasing or sale. Hence it is that so many mineral properties in the United States are now operated under the lease system, so that government ownership works no hardship to the people of the country, but is a means of producing revenue, instead of adding to the wealth of those who have only inherited the property of the miner who is willing to work the minerals.

OBTAINING A PATENT.

It is generally supposed that the patentee of an article, process or new invention has a sure thing and an easy means of gaining wealth, on account of the successes made by a few fortunate inventors. The general public are not aware of the uncertainty and tedious delay which an applicant for patent has to experience before his papers are considered by the patent office in the first stage. To such an extent is this the case, that after a patent has been applied for, it generally takes from six to nine months before it can be considered. It is not therefore wise for the inventor to place his invention on the market until he has had his invention passed upon and accepted for patent. If he does so, and marks it "patent applied for," that does not protect him from infringement by makers of a similar article produced with slight changes. He has not obtained his patent, and cannot prosecute or stop such infringement of his rights. On this account, the most necessary invention which our inventive geniuses of the patent producing fraternity can originate at the present time is a new patent process for the complete reorganization of our slow and unbusiness-like system of conducting the issue of patents in the United States patent office. As the last thing any government has been known to do is to effect a reform in the civil service for the benefit of suffering humanity, and as we desire it for many of our most intelligent readers and patrons, we are compelled to call the attention of the already over-worked officials of this branch of the public service to the valuable use the inventors of this country can put their inventive ability to, in perfecting a new process or machine for aiding and expediting the at-present slow process of patenting an invention. Life is too short in most instances, but it is too long for a man to wait until after he is dead to receive the benefit of his invention, or until his invention is protected by law. In regard to this matter, the great inventor, Thomas A. Edison, has had some experience which he can apply to electrify the system of passing on patents, and thereby become the greatest inventor of the age.

INTERNATIONAL MINING CONGRESS.

As already noted in these columns, the first session of the International Mining Congress will assemble in Salt Lake City, Utah, on the 6th, 7th, 8th and 9th of this month. This organization is the result of the Inter-

national Gold Mining Convention, held in Denver last year at similar dates.

"The objects of the Convention are to secure such national legislation as may be calculated to promote the business interests and development of the resources of the mining industry in North and South America; to bring together mining men and investors; to increase reciprocal trade among them; to discuss such questions as are naturally suggested by its objects; to cultivate acquaintance, fraternal feeling and hearty co-operation among various mining, commercial and labor bodies represented; and especially to take under advisement the importance of the creation, by Congress, of a department to be known as the Department of Mines and Mining, thus securing a Cabinet Officer that represents an interest which affects more than one-third of the people of the United States."

This JOURNAL has on former occasions advocated the union of North and South American countries, in the interests of the large silver mining industry of the American continent, which produces almost all the silver of the world, with the single exception of Australia, as the only solution of the problem for securing the just value of a metal of exchange in the form of money, which the poor of all nations cannot do without. If these countries make treaties to prohibit the export of silver in bars, or other form, except as coin, minted by each country at a fixed ratio, then will the people of Europe and Asia be forced to buy our silver at coin value, to supply their own demand. This all important and far-reaching subject comes strictly within the province of the International Mining Congress.

MINES AND QUARRIES.

The underground operation of extracting the metallic minerals is generally conducted by sinking shafts, and driving tunnels and levels, under cover of the surface ground or back of the vein, and as depth is attained so does the expense of mining increase. This feature in mining has only one exception, as in the case where a mine is located on a high mountain side, and the mining is conducted by overhand stoping, and where pumping is not necessary. In this instance, the cost of mining only increases with the length of haul along the levels of the mine. The increase of cost as depth is gained is always considered the natural result of mining work, under all other circumstances than that mentioned. The mining of ores is a destructive proceeding, as its object is to break up the mineral, so as to admit of handling.

In conducting quarrying operations or open work, which is the common manner of extracting the non-metallic minerals, the chief expense is at the inception of the work, as surface soil and top rock, or decomposed material has to be removed. In consequence of this, the operation of quarrying is almost always conducted with less expense as depth is reached. The deeper the work goes, the more solid and free from climatic change is the material to be quarried found, and consequently of more value. Quarrying operations of the destructive class are the simplest and require less skill, while that of the constructive order are the class which require the material to be kept whole, which is the most difficult, as in quarrying slate rock, marble and building stone, and are best operated with large capital and on an extensive

scale. In both kinds of quarrying, the expense decreases with depth, and furnishes a striking difference between the operation of mines. In a southern and mild climate this feature is more noticeable than in the frozen northern regions. Hence it is that the quarrying of many non-metallic minerals, offers profits in excess of mining the precious metals, when the all-important question of marketing the product is of easy solution.

THE NEW REVENUE BOND BILL.

This bill has been passed by both branches of Congress and has received the signature of the President. It is a law of tripartite features: one enlarges internal taxes, another provides for the issuance and sale of bonds to produce the means for carrying on the war with Spain and the third relates to the money question, by authorizing the issuance of \$150,000,000 of treasury certificates, to be put out as emergencies demand, and to be taken up at the convenience of the treasury, and also requires that the silver bullion in the vaults of the treasury shall be coined at least at the rate of \$1,500,000 per month.

The collection of a larger revenue, and the imposition of increased excises will have some influence unfavorable to the development of industries, and will be something of a restraint upon commerce. It does not effect a change or modification of the financial system. The issuance of the treasury certificates will increase the circulating volume. It leaves standing the ruling of the treasury department that all our paper money is redeemable with gold coin, except the silver certificates, which are specifically made redeemable with silver coin.

The bonds authorized are not to be sold to a syndicate of bankers, unless there is failure to sell them by subscription and as a popular loan. The law contemplates their sale in small denominations, that they may be widely distributed, and perhaps so used as to some extent perform the office of a circulating medium. Whether or not they can be so disposed of will shortly be determined. Bonds sold through syndicates are usually concentrated in the hands of few holders. If the popular loan plan succeeds in this instance, it will be an entering wedge for the policy of having our own people become the holders of the public securities.

The silver coinage proposition is a slight concession to the silver sentiment of the country, and if the law is faithfully executed, in time the treasury will be relieved from the storage of a large quantity of bullion. It will take some time, however, to coin it, if no more than \$18,000,000 are coined annually, whether more shall be coined or not is left to the discretion of the secretary of the treasury. It is known that Mr. Gage is a believer in a limited volume of money, and that our circulating medium should be confined to gold coin, and national bank paper redeemable with gold coin, with the quantity of subsidiary silver coins that convenience may require. Hence it is to be presumed that he will not coin any more silver bullion than is compulsory by law. The silver bullion on hand comprises seigniorage to the extent of \$42,000,000, and were it all as promptly coined as possible, that sum would be added to our volume of circulating medium.

The bonds authorized are to be made payable in coin according to existing law and previous practices, and not in gold coin as Mr. Gage would have done.

The law will be irksome to our younger population who have not been accustomed to sweeping excises and to a horde of tax gatherers. To the older class, it will be a reminder of the civil war, and of the five or more succeeding years. To them it will revive an unpleasant reminiscence.

The measure is a compromise. The senate and house held widely divergent views, and for a time it seemed as if both sides would be stubborn, but the presence of war forced both sides to make concessions. There was a necessity for more money to conduct the war, a sum that cannot be immediately produced from taxation alone. One side wanted bonds as well as additional taxes, and the other was quite willing to grant more taxes, but in lieu of bonds wanted an issue of greenbacks, and all the silver bullion in the hands of the government speedily coined, that the country might have the benefit of the seigniorage which, as before stated, amounts to \$42,000,000. It now sleeps in the treasury, doing no good to the government or the people.

THE ELECTRO-CHEMICAL AND ELECTRO-METALLURGICAL INDUSTRIES OF EUROPE.*

The Electrolytic Tin Industry.

The extraction of tin from its ores by electrolytic methods has not yet been attempted on an industrial scale, though several patents have been filed relating to apparatus and processes for effecting such extraction. The electrolytic tin industry is at present confined to the recovery of the tin from tin scrap, and to the production of pure tin from raw tin by an electrolytic refining process, similar to that used for copper.

The recovery of tin from tin scrap is one of those operations for which electrolysis seems to have been specially designed, and one would expect in these modern days, when the profitable utilization of city refuse is considered a subject of primary importance, that any feasible process would meet with enormous success. This is however not the case. Many processes have been patented for the electrolytic treatment of tin scrap, and some of these are now working with successful results in Germany and France, but the number of such works is much more limited than one would have expected, and the difficulty of obtaining large quantities of the raw material at reasonable rates hampers the growth of the industry. Tin scrap contains from 3 to 9 per cent of tin, the average amount of tin present being 5 per cent. Thus in order to obtain one ton of tin from this scrap, even supposing the whole of the tin is recovered, 20 tons of scrap must be dealt with, and where the collection and delivery of the scrap at the electrolytic works costs \$6 to \$7 per ton (as in some cases) the recovery process is burdened with a very heavy charge. In some localities, however, the scrap can be collected and delivered for treatment at one-tenth of this cost, and in such places, and especially in localities where other manufactures lead to the production of great quantities of clippings of tin plate, the electrolytic recovery processes have every chance of success. Three processes are at work, and these may now receive brief description.

In Germany, Borchers states that several firms are recovering tin from tin scrap by

electrolytic methods, though he does not specify names or localities. It is interesting to note that much scrap is being shipped to Europe from Baltimore, and it is probable that part of the supply of these German works is drawn from this source. The firm of "Goldschmidt u. Cie. of Essen a. d. Ruhr" was the first in Germany to attempt the recovery of tin on a commercial scale.

No details have been published concerning the process used in the majority of these works, but it is most probably that patented by Gutensohn and further improved by Siemens & Halske, while in the case of one works in Berlin the apparatus and process patented by Smith is stated to be used. The principle of both Gutensohn's and Smith's process is the same. The tin scrap is packed into baskets made of wooden laths holding each about 140 lbs., and is used as anode in a cell containing dilute sulphuric acid as the electrolyte, and plates of tinned copper as the cathode. The acid of course attacks the iron as well as the tin of the tin scrap, but only the latter metal is deposited at the cathode, and when the acid has become saturated with iron, it is run off and worked up for ferric sulphate. According to Smith, and Siemens & Halske, an EMF. of 1.9 volts suffices to provide the necessary current density; and a current efficiency of 50 per cent is obtained. The remainder of the current is lost, owing to the concurrent action upon the iron of the anode material.

In France the recovery of tin from tin scrap is effected by a process in which caustic soda solution is used as the electrolyte. The advantage of this solution is that it acts only on the tin, and the iron remains unattacked in the baskets containing the anode material.

The disadvantages are that heat must be applied, otherwise only oxygen will be produced at the anode on passage of the current, and that 10 per cent of tin remains in the electrolyte as sodium stannate, and cannot be deposited at the cathode by the current. The solution used in this process is stated to be a 10 per cent caustic soda solution, containing a definite proportion of common salt.

In England, Smith's process is stated by Ahrens to be at work, and in 1896 a company was registered for operating the process patented by Claus. In this process, tin scrap or any alloy of tin is used as an anode material in an electrolyte containing alkaline sulphides. Sodium sulpho-stannate is formed, or the corresponding potassium or ammonium salt, and the deposition of tin from this solution is easily effected. The iron remains undissolved, and as the electrolyte requires heating during the electrolysis, the process closely resembles that in which caustic soda is used as the solvent.

The writer has written to Mr. Claus to inquire how this company is progressing, and learns that the plans are now completed for the commencement of operations upon an industrial scale, and that the process will shortly be at work.

The only factory known to the writer in which raw tin is refined electrolytically is that of Messrs. T. Bolton & Sons, Churnet Valley, Staffordshire, England. The raw tin is cast into plates suitable for use as anodes, and is placed in electrolyzing vats containing dilute sulphuric acid. A high current density is employed, and a very rough crystalline deposit of tin obtained at the cathode. The crystals can easily be detached, and are washed, dried and melted in order to prepare ingots of pure tin, which are used to coat

with tin some of the classes of telegraph wire prepared by this firm at their wire-drawing works in the same neighborhood.

The cost of the energy required to produce one ton of tin by these processes can easily be calculated by means of the electro-chemical equivalent for tin, and the data already given. Take an E.M.F. of 1.9 volts (for the sulpho-stannate solution this would probably be reduced) and a current efficiency of 50 per cent, the E.M.F. requisite to produce one metric ton tin per 24 hours will be:

$$1,000 \times 1,000 \times 1.9 \times 100$$

$$= 193.8.$$

$$.000 \text{ } 309 \times 60 \times 60 \times 24 \times 735 \times 50$$

Taking the cost of the E.M.F. hour at \$.002, the cost of the electrical energy necessary to produce a metric ton of tin from tin scrap or tin alloy, will be, $193.8 \times 24 \times .002 = \9.30 .

It is thus apparent that if the raw material can be delivered at a reasonable cost at the works, the processes can be conducted with some degree of success.

Other processes have been patented for the recovery of tin from tin scrap—as for example that of Vortmann & Spitzer, a fusion process, and that of Borchers, in which an electrolyte containing sodium chloride is used, but the writer is not aware that these are being worked upon an industrial scale, and therefore a description of them cannot be included in this series of chapters.

The future of the electrolytic tin recovery processes would appear to depend entirely upon the facilities offered for the collection of tin scrap at a low cost, and it is possible that in the future, when the collection and utilization of city refuse is placed upon a more scientific basis than is at present the case, the industry will develop into one of considerable importance. †

Concerning Chlorination.

VANCOUVER, May 30, 1898.

TO THE EDITOR OF THE "MINING AND METALLURGICAL JOURNAL," Stimson Block, Los Angeles, Cal.

SIR:—I beg to call your attention to an error in the description of the chlorination process, for the extraction of gold, which appeared in your issue of the 15th May, inst., namely, that "sulphuric acid and lime are added" to the roasted ore and water charged into the barrel, whereas, in reality, hydrochloric acid and lime are added.

I need hardly remind you that chlorine gas cannot be obtained from sulphuric acid and lime.

Yours faithfully,

(Signed) J. O'SULLIVAN,
Chief Assayer and Chemist to the B. C. Agency, L'd.,
Vancouver.

Mr. O'Sullivan was right when speaking of the question concerning the chlorination process, as described in May 15th issue: that sulphuric acid and lime cannot form chlorine gas, but if Mr. O'Sullivan will write out his chemical equation, concerning his advice as to making chlorine with hydrochloric acid and lime, he will find out that his mixture will be just as unsuccessful as the one above mentioned, as the reaction taking place will be: $\text{Ca}(\text{OH})_2 + 2\text{HCl} = \text{CaCl}_2 + 2\text{H}_2\text{O}$, or, in other words, calcium chloride and water.

We will admit there was a typographical error made by saying "sulphuric acid and lime" instead of sulphuric acid and chloride of lime are added, as it should have been.

We will also refer Mr. J. O'Sullivan to Henry Wurtz's article in *The Mineral Indus-*

try for 1896, annual Vol. V. The Hydro-Metallurgy of the Precious Metals, pages 312 and 313:

"Chlorination has, like amalgamation, been subjected by inventors and projectors to a vast number of experiments, both alone and in conjunction with amalgamation. Chlorine has been used directly in its gaseous form—as first by Plattner—under ordinary pressure and under elevated pressure, sometimes under pressure high enough to liquefy it (that is 9 to 10 atmospheres) at ordinary temperatures; also in solution in water, and in liquids that make stronger solutions than water, also in very weak solutions such as are employable in open vats without suffocating the operatives. It has been employed after exhaustion of air from the ore. Instead of passing the gas through the ore, the ore has been passed through the gas. Many chlorinogens, containing potential chlorine have been used. Indeed, one of the commonest of these in use was employed by the earliest investigators, Persy, Duflos, and Lange. This is a mixture of common bleaching powder (chloride of lime) and muriatic acid (hydrochloric acid). With this Duflos reported good results, and Lange got better results than with free chlorine, as proposed by Plattner. * * * *."

"In addition to the chlorinogenic mixtures already mentioned, there are others. The first patentee of a chlorination process, Spieker, used bleaching salt with sulphuric acid, instead of hydrochloric. This gives hypochlorous acid HClO , a very strong chlorinogen. Subsequently, others have used hypochlorous acid, first isolated and freed from the precipitate of gypsum, which must have embarrassed Spieker. Mixtures of oxalic acid and bleaching salt have been claimed to present advantages, also mixtures of bleaching salt and ferric chloride. Both these latter are transportable in solid forms, and hence present conveniences."

THE BONDING AND LEASING SYSTEM.

Mining men in Southern California seem to have neglected the advantages that have resulted to other mining countries from bonding and leasing mining properties. It is true that a certain amount of mining enthusiasm must be engendered in a certain district before this system can be fully put in practice, yet there are many properties scattered through the southern half of this state, owned by men who have a good thing, and know they have it, but are unable to furnish the capital to properly develop their mines.

The plan of leasing new and undeveloped property should thrive in Randsburg and similar camps, where the necessary faith in the country already exists, and particularly where the working miner as a lessee has facilities for the treatment and sale of his ore. Aspen and Cripple Creek are shining examples of what can be done with the leasing system, as hundreds of lessees who have made money in these places will bear evidence. Among the capital prizes drawn by lessees may be mentioned the Johnson lease on the Moon Anchor mine, at Cripple Creek, where the lessees took out in one year \$300,000, and brought an obscure mine into prominence as a bonanza. The Maroney lease on the Anchoria Leland produced \$235,000 in six months, and nearly a dozen sets of lessees on the Pike's Peak mine have become rich through leasing. It enables men of small means to get into a favored locality, and take

a chance at the capital prizes that are usually reserved for men of large means, and at the same time develop the owner's mine without cost to him but profit.

To illustrate the system: "A" owns a mine in a favorable locality that is undeveloped. "B" is a miner, or a man of small means who has been unable to get a mine of his own. "A" and "B" agree that "B" shall lease the mine of "A" for the term of one year, "B" to work 60 shifts per month, to have the privilege of taking, extracting and shipping ore therefrom, "B" paying to "A" as rent therefor either a straight or graduated royalty, running usually from ten to sixty per cent, after deducting milling or smelting and freight charges. Where a bond is given with the lease, an option to purchase is written out and usually accompanies the lease, in which it is agreed that if at any time, within the period of the life of the lease, "B" shall pay to "A" the sum agreed upon as the price of the mine, "A" will convey it to "B". The usual practice is for "A" to place a deed in Escrow in some bank, under an agreement that if "B" pays the purchase price within the designated period, the deed shall be turned over to "B". Sometimes, the payments on the bond are partial: the amount of the bond being \$50,000, "B" agrees to pay "A" \$5,000 in thirty days, \$10,000 in three months, \$15,000 in six months, and the balance in one year.

Sometimes mines are leased in blocks, and a dozen sets of lessees may be working at the same time on the same claim.

I am aware that a great deal of leasing and bonding are being done in Randsburg and vicinity, but not enough. Why should so many miners waste their time prospecting in the desert, where, if a mine is found, it will be impossible for the prospector with limited means to develop it and make it a paying mine when he can with much more hope of success get a lease near a paying mine where, if he strikes pay ore, he will have railroad and milling facilities that will insure him success.

In two or three years from now, the business men of Los Angeles will awake to the fact that many rich mines have been opened up in the back country, have passed into other hands and are beyond their reach, because they did not reach out and take them when they could have been obtained. For three years after the discovery of gold in Cripple Creek, Denver capitalists could not be induced to invest a dollar in the mines, while the Colorado Spring people, having faith from the start, invested and reaped their reward.

Prosperity.

"Speaking from a mining and smelting standpoint, I find that the west is surely more prosperous today than at any time since the depression, or great decline in silver, in June, 1893," said Simon Guggenheim, general manager of the Philadelphia Smelting and Refining Company. "There is no apparent reason why the whole mining section should not continue to prosper, even though the price of metals is somewhat depressed.

"It is true that not many new camps of importance are being discovered or developed, yet the mines that have been in existence for years are today making satisfactory profits, and there still exist many bonanzas, which show not only a large source of revenue to the owners, but give employment to many.

[†] The writer has recently learned that in some large towns old tins are being collected and sold for the manufacture of box-clips. This method of utilization will, of course, tend to prevent the extension of the recovery processes.



FIG. 1. A GENERAL VIEW OF THE EXTERIOR OF MESSRS. HECKELMANN & MCCANN'S SAMPLING AND TESTING WORKS NEAR THE CITY OF MEXICO, MEX.

MINERAL TESTING AND SAMPLING WORKS.

The new mineral testing and sampling plant of Heckelmann and McCann were inaugurated March 26th. A large number of prominent gentlemen of the City of Mexico, besides the students of the School of Mines were present at the ceremonies.

It is a well known fact that many mines are closed down for want of a knowledge of some economical method of treatment. In many cases mines are so situated that the ore will not pay for shipment, but would yield a handsome profit if the proper kind of mill were erected on the spot for treating the ore at the mine. By having such ores thoroughly tested, in order to determine the system of treatment best suited to them, one can go to the expense of the erection of the mill with the certainty that a definite percentage of its value can be extracted.

In many cases a system of a treatment has been inaugurated at a mine at great cost, which upon trial is found to be unsatisfactory and is condemned. It may be that this treatment is unsuitable to the ore in question. In this case a preliminary test of the ore in some testing works would have shown this at a comparatively small expense and have saved the mine owner thousands of dollars.

It may be that this treatment, although suitable to the ore is not giving good results because of improper handling and were a series of tests to be made, a method might be found to overcome the obstacles, and obtain a high percentage of extraction.

The general object of a Testing Works is to test any ore thoroughly, by all or any of the various methods of successful treatment, by which the precious metals are extracted from their ores in order to determine which method is best suited to the particular ore. These works are particularly useful to persons who are contemplating the erection of a mill at their mine, and desire to know what systems of treatment will yield them the best results.

They are also useful to those who have a mill of some kind in operation upon their property, and desire to ascertain whether a better extraction cannot be obtained by making some change in the existing methods of treatment, and they are exceedingly useful to

Mining Engineers, who, while they may be able to judge from the character of an ore that a certain system may be suitable to it, yet cannot tell the exact percentage of extraction to be obtained thereby, without having tests made of the ore.

Every one familiar with the subject of Milling knows that in order to obtain the best results by any system of treatment, careful, patient, systematic and intelligent investigation is required, and this work cannot be done in a large mill, not especially constructed for this purpose, except at an enormous expense, and even then the test should be made by a metallurgist, especially trained for this experimental work, by study and practice of the best methods in use.

In Messrs. Heckelmann and McCann's sampling and testing works, a test may be made on a sample of from 500 kilos to 10 tons of ore, by all or any of the systems of treat-

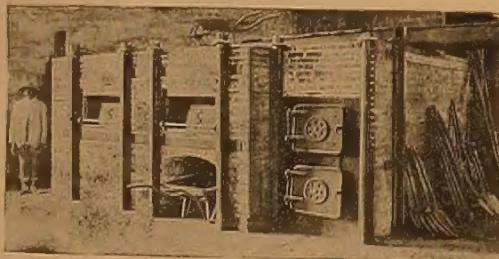


FIG. 2. FURNACES FOR CHLORIDIZING AND DEAD ROASTING.

ment in use in order to determine exactly what percentage of extraction may be obtained from the ore tested.

Fig. 1 shows a general view of the exterior of the plant which is located in the heart of the Mexican republic a short distance from the City of Mexico, at a place called Nonoales, on the line of the Mexican National Railroad. A siding passes the front of the building.

Fig. 2. A front view of the furnace for chloridizing and dead roasting is shown in this illustration. This plant consists of two reverberatory roasting furnaces, separate and distinct from each other. Each having its fire box and a hearth 5'x10' with two working doors.

Fig. 3. The Chlorination Plant consists of a series of lead lined boxes. Two for chlorination by the Plattner process, the others, for precipitation and clean-up tanks. A nineteen inch Chlorine generator, and a Hydrogen generator.

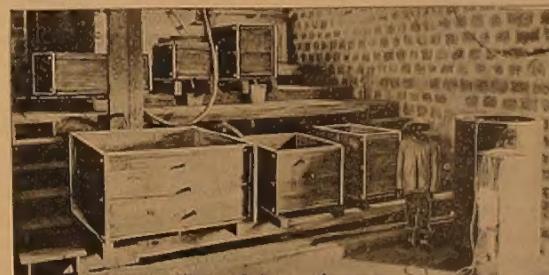


FIG. 3. CHLORINATION PLANT.

gamation to work the tailings from the Amalgamating plates and Concentration. This plant is composed of a 30" Amalgamating Pan, a 6" settler, a 15" clean-up Pan, an Amalgam safe and strainer, a 10" retort and a 16" bullion furnace. Settling tanks, etc.

The results depend very much upon the precision and care exercised in taking samples of the ore at different stages of the test. The sampling room has been fitted up with every convenience known to modern practice.

It has a cement floor 30'x60' and contains a 7"x9" Dodge Crusher; 12x12 geared rolls; a belt elevator 20' between centers; a revolving screen $\frac{1}{2}$ " round perforations; Fraser & Chalmers Sample grinder, Platform scales; sample finishing room, etc.

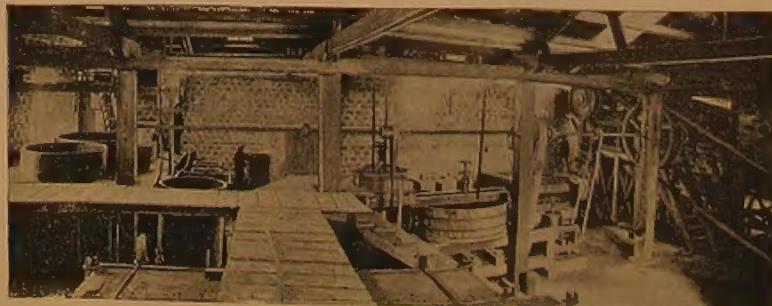


FIG. 4. GENERAL VIEW OF THE INTERIOR.

Fig. 4 gives a general view of the interior, where experiments are made in the treatment of ores on a practical working scale by the systems of Plate Amalgamation, Concentration, Roasting, Pan Amalgamation, Lixiviation, Cyanide Chlorination.

Fig. 5. The Power Plant consists of an Iron Water Tank 8'x6'x8' with a capacity of 2000 gallons. A No. 22 Gardner low service tank pump. A Fraser & Chalmers 40 horse power tubular boiler 14"x44". An Erie City Automatic cut off governor Engine cylinder 10 x 12, giving a minimum of 35 horse power. No. 0 Gardner duplex boiler feed pump, and a No. 3 Standard feed water heater.

Fig. 6. Plate Amalgamation and Concentration. This plant consists of a Hendy 2 Stamp Tripple discharge 850 ft stamp Battery. Four Electro Silver-Plated Copper plates (one ounce of silver to the square inch). A 5 foot Hendy Triumph Concentrator, the necessary settling tanks, etc.

Fig. 7. View of the front of the Plant showing line of railroad over which the ore to be sampled is transported to the very door of the establishment.

Fig. 8. This illustration shows the lixiviation and cyanide plant in operation in Messrs. Heckelmann and McCann's Sampling and Testing plant. It consists of two leaching tanks 6' diameter 2' deep. Two precipitation tanks 6' diameter and 4' deep. One solution stock tank 5' diameter and 7' deep. One precipitation tank 3' diameter and 6' deep, and one Johnsons Laboratory Filter Press.

Fig. 9 shows another view of the interior with the amalgamating plates and concentrator in the background to the left of the picture.

Figures 10 and 11 show the plant for Pan Amalgamation to work the tailings from the Amalgamating plates and Concentration. This plant is composed of a 30" Amalgamating Pan, a 6" settler, a 15" clean-up Pan, an Amalgam safe and strainer, a 10" retort and a 16" bullion furnace. Settling tanks, etc.



FIG. 5. POWER PLANT.

The difference between any department of this testing plant and a large mill operating under the same system, is not in the size, but only in the number of machines used in the mill, so that the conditions under which the tests are made are exactly the same as those in practice in larger establishments. The capacity of the Stamp battery Plates and Concentrator is, for instance from 6 to 8 tons per day, so that it can readily be seen that such tests are of real value, and that the results thereby obtained are the same as those obtained in large works.

In the test made in the plate amalgamation and Concentration department of the works, it is necessary at times to crush the ore through several sizes of screens before one can state absolutely whether the system is suitable



FIG. 7. VIEW OF THE FRONT OF THE PLANT SHOWING LINE OF RAILROAD.

or otherwise. Take for instance the case of an ore in which the mineral is disseminated throughout the gangue in very small particles. In such a case, if the ore were crushed through a coarse screen say 20 holes to the square inch in order to secure a large output for the mill, the gangue would probably still contain so many mineral particles that one might decide that the ore was neither a free milling nor a concentrating proposition, whereas if the same ore were crushed through a fine screen, say 80 holes to the square inch, the separation of the mineral particles from the gangue might be so complete that it might be a very fine proposition for free milling or concentration. On the other hand, it might be more economical to crush through a coarse screen to separate only a portion of

the mineral constituents by Plate Amalgamation and Concentration, and work the tailing from these processes by some other process, such as Pan Amalgamation, Lixiviation, etc.

The above example shows that in a simple matter, of a variation in size of the screen used, the results of the test may be decisive for, or against a certain system so that it is often necessary to have a series of tests made in crushing with different size screens, to determine, which will give the best results. This being the case, how much more necessary is it to make a series of tests in every other department of Milling.

In Concentration the results of the tests are influenced by the size of the material, quantity of water used, inclination of the table, rapidity of the shake, etc.

When roasting ores, the results are influenced by the temperature, length of time of the roast, amount of salt added, and time of adding the salt to the ore, and many other causes.

The results in Pan Amalgamation are determined by many factors, such as the fineness of the ore, the percentage of chlorination, temperature, time of operation, thickness of the pulp, quantity of chemicals used, etc.

The Lixiviation results vary according to the fineness of the pulp, the degree of chlorination, the temperature and strength of Hypo solution.

In the Cyanide process, similar factors may enter into consideration.

By the Plattner process of chlorinating gold ores many other factors have to be considered;



FIG. 6. PLATE AMALGAMATION AND CONCENTRATION

metallurgist, mine inspectors, mineral land surveyors, brokers, promoters, mining exchanges and investment companies, together with the mining codes of the different countries, and digest of the statutes relating to corporations, liens and mining in the different states and territories and the Canadian provinces.

Poole Bros. Mining Directory is one of the finest directories ever compiled, containing about 35,000 names of people interested in mining matters.

The Digest of Corporation Liens and Mining Laws of the states and territories of the United States is a complete book in itself having been compiled expressly for the mining directory by thoroughly reliable and well known



FIG. 8. LIXIVIATION AND CYANIDE PLANT.

and in each system the test may require a number of trials before obtaining the highest percentage of extraction.

Now, since it is desire that the results given out shall be of permanent and real benefit to their clients, Messrs. Heckelmann & McCann are determined to give satisfaction. This can only be done by making patient and careful investigations, repeating each operation until the best results are obtained therefrom, so that these will be conclusive and trustworthy.

About \$20,000 has been invested in the entire plant, which has a capacity of about 8 tons daily, beside the erection of a good solid building in the outskirts of the City of Mexico.



FIG. 9. ANOTHER VIEW OF INTERIOR

attorneys-at-law.

The Directory is an invaluable adjunct to any mining man's library.

One of the prettiest-covered catalogues we have beheld for some time is one issued by the Witte Iron Works Company, of Kansas City, Mo., builders of the Witte Gas and Gasoline Engines, descriptive of their engines. The utmost care is exercised in the testing of Witte Gas or Gasoline Engines. This firm has the facilities second to none in this respect, and keep every engine under full load for ten hours before finally letting it go.



FIG. 10. PAN AMALGAMATION PLANT.

Poole Bros. Mining Directory and Reference Book of the United States, Canada and Mexico, contains a list of the Mining and Quarrying companies and operators, smelters, reduction and sampling works, blast furnaces, rolling mills, iron and steel works, giving location of same, names of officers, annual output, stamp mills, coal breakers and washes, Coke ovens, etc., with the railways, water routes and express companies to all points at which above interests are located, or nearest shipping point.

It also gives a list of mining, mechanical and electrical engineers, assayers, geologists,



FIG. 11. PAN AMALGAMATION PLANT.

CORRESPONDENCE CALIFORNIA.

Garlock Mining District.

There are about 60 claims being developed in this district. Adam's placer claim is showing up well. The Beecher claim is also a good property, having produced ore running \$30 to \$60 per ton. There is a tunnel in on the ledge, 75 feet.

Carpenter & Grady have a fine piece of property, which assays from \$25 to \$35 per ton in gold. Other mines in the Mesquite Gulch are silver-bearing, but not much developed.

All Silent Friend mine and its extension, owned by Geo. D. Vedder and Chas. Orphion assays about \$40 per ton, and has a large quantity of good ore on the dump.

One of the most valuable group of mines in the entire range is composed principally of the Ben Hur and Dodica mines, owned and operated by Dr. W. H. Wright. The ore is free milling.

There are some very fine claims in the Mesquite Gulch that run very high in silver and gold.

There is also considerable dry washing carried on in this vicinity, and it is a profitable business.

There are now six mills at Garlock. Mr. Henry, of the Henry mill, expects to put in a cyanide process.

Mr. L. E. Porter, of the Porter Gold and Silver Extraction Co., representing Los Angeles capitalists, is also putting in one of their improved cyanide plants.

This year has been an exceptionally good one. The weather has been pleasant. The town is healthy and prosperous, and while there is no boom, this district is forging ahead, and there is an opening for investment here.

Miscellaneous Mining News.

ARIZONA.

John Francis, the well known mining and smelting man, returned last week to Tombstone from Middlemarch, in Cochise county. He reports that camp enjoying a high degree of prosperity. A sixty ton smelter is at work and the results are such as to justify the belief that prosperity has come to the camp to stay.

Los Angeles parties have become interested in some of the properties adjoining the Monte Cristo mines in Arizona. These properties are known as the Cosmos group. They have started with six men to develop them systematically. The gold belt in the same vicinity is also being prospected.

CALIFORNIA.

CALAVERAS COUNTY.

J. T. Armstrong of Los Angeles has bonded the Blizzard mine in West Point district, Calaveras county, from the Bardsley brothers, and will proceed to active development with a large force of men.

INYO COUNTY.

A mammoth gold ledge, forty feet wide, the ore giving an average assay of \$5 per ton,

has been found at Lone Pine, Inyo county, California. The ledge has been prospected for a distance of 2,000 feet, while the surface indications show that it is probably about a mile in length. The Inyo Mining Company has struck a rich body of copper ore on the 700 foot level of its mine, and will put in an additional plant for smelting the new ore. This mine is now yielding gold, silver, lead and copper.

KERN COUNTY.

It is reported that a new Electric Smelting Process is about to be erected near Garlock. The miners of that district will give it a most thorough test, and we hope it will prove a success.

Reports of a crusher and smelter being erected at Mohave continue to come in and assume a very plausible shape. With a smelter erected at Mohave, the mines of Southern California will make a showing for themselves.

The Eureka mill has been running some very rich ore for the past month, though it has come in small lots from different mines. The value of the ore crushed may be judged when it is known that the little two-stamp mill has turned out more than \$13,000 in bullion in the time mentioned.

The Ophir mill has just cleaned up on a run of about 100 tons of ore from the Burrough No. 1, but the amount we were unable to learn. It has already been demonstrated that the mine is a good one, and if the owners see fit to keep the results of their runs to themselves, it is no affair of the public, and the public should not expect to share the knowledge. There is entirely too great tendency to magnify the size of clean-ups in many cases, and we really admire the mine owner who has the good sense to keep his affairs to himself when the owner is a private individual and not a corporation. But when the corporate manager undertakes to keep the knowledge of what is going on from the stockholders, it is a different matter, and calls for an investigation. The Ophir mill is now engaged on another run of about fifty tons of ore from the same mine, so it is to be presumed that the results of the last run were very satisfactory.—*Miner.*

NEVADA COUNTY.

The Empire mine near Grass Valley, which is one of the deepest worked mines of the coast, is being rehabilitated. The old buildings which cover the hoisting works and milling plant are being torn down and replaced with modern and commodious buildings. In addition a number of improvements are to be made to the mill, which will reduce the expense of reducing ore. The concentrators are to be moved and placed upon a platform, and a room for drying the concentrates more rapidly will be made, mainly of glass. Two dams of considerable size will be made to hold the tailings, from the mill, which will be worked over by a scientific process.

RIVERSIDE COUNTY.

The Virginia Dale mining district will not be permitted to remain idle this summer. Water has been secured in abundance and with the erection of several mills to work the ores, incentive is offered to prospectors and owners to proceed diligently with their labor.

SAN DIEGO COUNTY.

C. W. Pauly, receiver of the Golden Cross mines at Hedges, has filed in the superior court his sixth monthly report. The clean-up on May 1 yielded \$45,018.61 in gold bullion, from other sources \$1,428.60, making the total receipts for April \$46,447.21. There was paid out for the company \$42,323.06, which included \$11,500 paid to creditors. The company had \$56,941.02 on deposit in the bank on April 30. The above clean-up was from 100 stamps. On the first of June, an additional forty stamps were put in, and will be run continually, making 140 stamps now dropping.

TUOLUMNE COUNTY.

For some time it has been rumored that a rich strike has been made in the Golden Treasure mine, owned principally by attorney Flack of Stockton. While the owners do no talking, it is known that in the 80-foot drift the ore grew richer as the upper wall was approached, and it is not at all surprising that an exceedingly rich streak should be found near the hanging wall. Much money has been expended on this property, and the owners well deserve their good fortune.

COLORADO.

The season's work at Taylor Park was begun about the first of last month, and with 50 men employed are now engaged in sluicing and washing the dirt and gravel down to bedrock. The force of men will soon be increased to 75. The Taylor Park Company, of Gunnison, owns about 3,000 acres of good placer land, which is patented and now in shape to be developed rapidly and systematically. The ground is very rich in gold, and the placers have been operated off and on for the last thirty years. In the past two years the company has spent at least \$300,000 in constructing a long ditch and building flumes for the carrying of a large flow of water.

The Belman mine, on Pewabic Mountain, near Idaho Springs, is receiving some attention from Mr. Depew and his friends, and negotiations are under way with Mr. Phil Mixsell for a right of way through the Mixsell Tunnel. The Belman has a large amount of development, and a vast quantity of mill dirt and ore is opened up, but the water excess has hitherto proved the great drawback. The right of way through the tunnel will develop down to 270 feet of depth, drain out all the water and open up ore for ten years to come without further depth.

Leadville Notes.

The lower Henriette shaft, of the Maid of Erin Silver Mines Company continues to ship lead-carbonate ore steadily, under the management of several sets of lessees.

The engineering corps of the Denver and Rio Grande Railroad are now surveying around the various shafts of the Ibex Mines and the flat in Idaho Park. It is reported that work will soon commence on the construction of the railroad to the mines.

The Yak Mining and Milling Company, working a large acreage through the Yak tunnel, are increasing their output daily. Five railroad cars are now sent out daily, beside considerable development work being kept under way. All mining is done at a minimum expense on these workings.

MICHIGAN.

Copper.

About 50 men are now working at the Aradia mine, now under the control of N. F. Leopold. Two quarter sections of land adjoining the property were bought by Mr. Leopold recently.

At the Winona mine 30 men are busy. A new hoist, air compressor, etc., are to be put in soon.

The Wolverine mine now employs 320 men, as against 175 a year ago, and 21 power drills are used.

MINNESOTA.

Heavy rainstorms at Virginia last Friday night did much damage to the Oliver and Ohio mines, as well as to the Auburn and Norman, in less degree. A large amount of ore, estimated at some thousands of tons, was washed from the Ohio into the Oliver cut, and much earth was run over the ore in the mines. Several days were required for cleaning up the properties. Auburn and Norman were both stripped, but mine by the milling process, so that the loss was not so great.

MISSOURI.

Joplin Ore Market.

Better weather for mining operations could not be asked for than prevailed during last week at Joplin, Mo., and the output was an exceptionally good one. The price for top grade zinc ore remained steady at \$27 per ton, but lower grades advanced from 50 cents to \$1.00 per ton. Lead sold all the week at \$21.75, but the condition of the pig lead market gives promise of an advance in local markets this week. About seventeen cars of jack brought \$27 per ton, about seven cars of Joplin ore selling at that price, six cars from Scotts City and four from Belleville.

For the corresponding week last year, top grade zinc ore sold at \$22.50, and lead opened the week at \$20, closing at \$21 per thousand, but the shipments for the week just closed beat last year's record by 2,555,970 lbs of zinc and 79,060 lbs of lead, and the value was greater by nearly fifty thousand dollars, the exact figures being \$49,943. For the corresponding 21 weeks last year the zinc shipments were less than for this year by 39,306,910 lbs, but the lead shipments were greater by 1,880,900 lbs. The value of the shipments were less by the enormous sum of \$713,120.

As compared with the previous week the shipments for the week show an increase of 817,370 lbs of zinc and 163,760 lbs of lead ore and the value was greater by \$14,114. Following is the turn-in by camps:

WB&B CITY.

	ZINC.	LEAD.
Center Creek.....	318,010	10,740
G. & S. Co.....	11,380	.....
Litchliter.....	9,190	.....
Free Coinage.....	9,140	.....
Columbia.....	8,433	.....
Della S.....	6,950	.....
Pearl C.....	6,400	.....
Hough.....	2,810	930
Curtis & Haymond.....	2,850	.....
Noble.....	2,760	.....
Total.....	372,310	17,280
Value, \$5,029.		

JOPLIN.

	ZINC.	LEAD.
John Jackson	238,340	.....
Joplin Prospecting Co.....	137,500	.....
Granby Co.....	136,640	23,750
Hustler Manufact'g Co.....	131,990	33,150
Chitwood Hollow M. L. Co.....	89,800	.....
Missouri Co.....	71,600	2,020
Roaring Springs.....	65,030	.....
Empire.....	58,290	3,020
Three Friends.....	53,500	.....
F. N. Perry.....	50,840	18,120
Witch Hazel.....	40,640	.....
North Heights.....	36,940	2,160
Rex.....	35,210	23,210
Victor.....	34,020	11,260
Snap-Warren.....	33,370	5,290
Tan Yard.....	15,500	.....
South Joplin, L. & Z. Co.....	14,640	5,280
Dickerson.....	13,960	.....
Top Run.....	12,390	24,840
Plunkett.....	12,250	1,650
Idaho.....	10,690	1,340
Lehigh.....	8,750	.....
Harrison.....	6,990	6,360
Leonard.....	6,780	3,180
Spring City.....	6,600	.....
Mohaska.....	6,540	.....
Gibson.....	6,070	.....
Kelley & Co.....	6,000	.....
Harvard.....	5,750	3,320
Scott.....	4,440	.....
Wright.....	3,500	1,750
J. H. Taylor.....	23,110	.....
Beckey Sharp.....	22,840	.....
Great Western.....	22,550	.....
Yale & Co.....	18,570	.....
Aunt Paity.....	13,190	.....
George Case.....	10,590	.....
Fairview.....	5,290	.....
Ashcraft.....	1,600	.....
Sundries.....	7,330	9,960
Total.....	1,361,890	298,300
Value, \$24,533.		

CARTRIVILLE.

	ZINC.	LEAD.
Get There.....	147,080	50,320
McKinley.....	137,960	4,700
Eleventh Hour.....	110,450	10,350
Chatham.....	104,750	28,510
Beckwith, Hall & Co.....	83,090	54,540
Davey & Son.....	76,510	5,880
Troup.....	62,410	5,990
Davey & Henderson.....	9,990	14,860
D. H. & D.....	6,240	9,410
Hannum & McElroy.....	.....	14,490
Burgner.....	.....	3,270
Brinkley.....	.....	1,030
Total.....	738,880	212,350
Value, \$13,865.		

ORONOGO.

	ZINC.	LEAD.
La Tosca.....	99,080	.....
P. E.....	98,000	.....
Gaddis M. Co.....	90,810	.....
Aurora.....	122,710	.....
Cass & Co.....	44,560	.....
Sunshine.....	14,810	.....
Little Blanche.....	64,740	.....
Maves.....	26,920	.....
Hatton.....	11,650	.....
Milspaugh.....	1,410	870
Johnson.....	.....	660
Sundries.....	.....	210
Total.....	578,590	1,740
Value, \$7,292.		

DUENWEG.

	ZINC.	LEAD.
Grounds & Irwin.....	554,050	55,000
Duenweg.....	278,820	179,450
Crown Point.....	38,910	41,430
Syndicate.....	.....	5,500
Gem Co.....	.....	900
Total.....	871,780	282,280
Value, \$15,601.		

CENTRAL CITY.

	ZINC.	LEAD.
Short Creek.....	186,660	12,310
Lone Lady.....	66,300	1,170
Iowa.....	51,050	3,010
Inter-Urban.....	42,400	.....
McHenry.....	21,400	.....
Kenwood.....	19,400	1,100
Total.....	387,230	18,070
Value \$5,324.		

AURORA.

	ZINC.	LEAD.
Minor & Rogers.....	149,700	3,000
Other lands.....	571,000	.....
Totals.....	720,000	3,000
Value, \$6,300.		

SCOTT'S CITY.

	ZINC.	LEAD.
Brumbeck.....	156,080	.....
J. B. Davis.....	40,830	.....
Riley Stevens.....	29,180	.....
Totals.....	226,390	.....
Value, \$3,057.		

	ZINC.	LEAD.
Galena.....	3,022,870	364,910
Value, \$45,714.		
Hell's Neck.....	237,420	.....
Value, \$3,147.		
Carthage.....	64,000	.....
Value, \$832.		
Belleville.....	168,180	.....
Value, \$2,270.		
District total.....	8,749,540	1,198,000
Value, \$132,964.		
District total, 21 weeks	175,468,150	23,177,300
Value, \$2,427,608.		

MONTANA.

The Silversmith, in the Basin district, is doing considerable development work again, and a small mill may be built.

Nine & Miller, who have been working the Park mine under sublease from Brady Hanson, shipped a car of ore last week.

James J. Brooks and Dave Rehill have opened up some placer ground on Basin creek and expect to make a cleanup soon.

Several men were put to work on the Katie smelter at Basin last week to get things in shape to commence putting up the big iron structure. Several teams are also hauling the iron from the cars.

There are several tons of iron at the Snow Shoe awaiting transportation. The teams now on the road are not sufficient to handle the product. The price being paid for hauling is \$4.50 a ton.

A find of rich ore is reported from the Little Lottie claim, in Ohio Gulch, the property of Leptien & Reynolds. The prospect is at present under bond to G. W. Walker, agent of the Northern Pacific at this place, who is sinking an incline shaft on the vein, now down about 25 feet.—*Helena Independent.*

NEVADA.

The smelter at Golconda was started June 14th. This and the concentrator adjoin. The last named has been in operation for several months.

The shipment of ore from Fred Weber's Cat Creek mine, says the *Hawthorne Bulletin*, milled \$42 per ton. It looks as though Fred will make some money out of his mine, and everybody will be glad of it, for he has been playing a losing game a long time. Charley Miller is now foreman of the mine.

NEW MEXICO.

Output of Hillsboro gold mines for the week ending Thursday, June 23d, 1898, as reported for *The Advocate*:

	Tons
Wicks.....	10
K. K.....	10
Richmond.....	10
Happy Jack.....	5
Snake Group.....	40
Opportunity.....	10
Sherman.....	5
Prosper.....	5
Eighty-five.....	5
Rex (silver-lead).....	5
Total.....	100
Total output since Jan. 1, 1898.—	3,730.

OREGON.

The Daisy mine, on Jump-off-Joe, is now under bond to J. G. Underwood et al. of San Francisco, and they have commenced work to pump the mine out. When it is developed, it is likely to make one of the best paying mines in Oregon.

The Ashland mine made a clean-up this week of 160 tons of ore—the third under the present management—and the result is stated to be highly satisfactory. They shipped on Monday a carload of concentrates to the Tacoma smelter.

R. Van Brunt, of the Steam Beer mine, says the new ditch will be completed next week, and will carry between 3000 and 3500 miners' inches of water, which will enable the company to run their mine six to seven months every year.

Hickler & Berrey are having built at Tolo, Ore., a boat 30x70 feet to dredge the Rogue River. The Rison Iron Works have the contract. The machinery consists of three engines, one driving an endless elevator of 36 buckets, each bucket of a capacity of 800 to 1000 pounds of gravel, of a speed of 18 buckets per minute, handling from 200 to 3000 yards per day. One engine drives the buckets, one a centrifugal pump for washing the gravel, one an electric light plant. The machinery runs night and day.—*Oregon Mining Journal*.

SOUTH DAKOTA.

The Sunnyside mine, on Newton Forks, is showing good results as depth is reached on the vein.

The Union Hill Mining Company will soon proceed to survey all mineral locations belonging to the company for patent.

It is reported on good authority that a large and valuable chute of ore was recently en-

countered in the Rau mine, on Squaw Creek.

The Holy Terror Company at Keystone is rapidly pushing a drift east from the 500-foot level, for the purpose of intersecting the Keystone veins.

In the Chicago, Two Bit and the Gold Hill Mining Companies' shafts, the water has of late become very troublesome, taxing the pumps to the utmost to keep it under control.—*Black Hill Mining Review*.

UTAH.

At the Ajax mine at Mammoth the shaft has now reached a depth of 475 feet, and the change in the condition of the ground gives fair indication of the near approach of ore.

Bullion-Beck of Eureka paid its dividend of 10 cents per share, or \$10,000 on June 15th. This carries the total dividends paid to date to \$2,495,000. No new ore contract has been entered into, and pending this the property will ship no ore.

Continental-Eureka, one of the great mines of Eureka, reported shipments of ore running high in copper.

Four Aces mine of Silver City made a shipment of ore which netted \$57.60 per ton. A very good grade of ore. The annual meeting of stockholders was held during the week and the old board of directors re-elected. The mine continues to improve.

The Dalton & Lark company, of Bingham, will commence the extraction of ore next week and will probably continue on indefinitely.

The condition at the Ceyser-Marion mine of Mercur are reported as favorable, and the new superintendent is introducing new methods of an economical nature. The mill is working 100 tons of ore daily and the batteries are working higher than for some time past.

The Grand Central mines of Mammoth, which have lately come into prominence, paid its first dividend of 12½ cents per share, or \$31,250, on the 15th of June. The company is making some phenomenal shipments, and the total for the month of June will probably reach \$100,000.

Horn Silver is expected to pay its quarterly dividend of \$20,000 July 1st.

The usual dividend of 5 cents per share will probably be declared on the 20th and payable on the 30th by the Mammoth company of Mammoth.

WASHINGTON.

Recent reports from the new Republic camp would indicate that it will soon begin to dawn upon the mining world that the greatest mining camp ever discovered is that embraced within the bounds of the Colville Indian reservation in Stevens county. It would seem that wherever the earth's surface has been scratched, rich gold-bearing ore was uncovered in quantity that would satisfy the most avaricious. It would seem also that the camp had not even been slightly prospected yet. Even in the Republic, where development has been carried on for a year past, the owners do not yet know what they own except it is one of the big mines of the world. What they have been following as a wall has turned out to be the richest body of ore in the mine. From other sections of the camp comes the report that wherever a ledge is prospected, values have been found that indicate surely that "gold exists where you find it."

The Republic mill has at last started up

and is being adjusted to its work as rapidly as possible.

Parties returning from the mines of Stevens county say that Spokane men are met with on every trail and on every camp. Virtually, Spokane owns Stevens county.

FOREIGN MINING NEWS

BRITISH COLUMBIA.

Active development work is proceeding on the following closely connected mines of the Illicillewaet. Hoisting and pumping works are being erected in the Tangier, and a concentrator and tramway in the Waverley, whilst a narrow-gauge railroad will shortly connect both properties with the C. P. R. main line. The English stockholders in the owning companies ought therefore this season to learn fairly thoroughly the true value of the mines that have been so highly eulogized by the managing director, Mr. Grant Govan.

It is stated that the Great Northern mines are being much better worked under the superintendence of the present manager, and that there is now found to be rather less of the presence of troublesome amounts of zinc than previously supposed. It is therefore hoped for tangible results ere long.

MEXICO.

San Luis Potosi.

The mines of this state for the last year produced precious metals to the value of \$4,600,000, being \$1,300,000 more than the product of the previous year.

Hidalgo.

La Perigrina, of Real del Monte, has made a rich strike which has sent the stock of this company soaring skyward. It is thought that a large ore body will soon be blocked out which will cause the stock to go even higher.

La Reina, of the Real del Monte, is fulfilling the expectations of those who have held that this mine was a bonanza.

Zacatecas.

The new 20-stamp mill has just been completed by the Compania Industrial Mexicana of Chihuahua, for the famous San Luis del Oro gold mines. Mr. W. H. Armstrong, the well known mining man who was selected as referee, has gone to the property to examine the plant and report upon its status, with reference to the contract under which it was furnished, no doubt is entertained that his report will show that the machinery is equal to that made in the U. S. This property, in the opinion of all the best mining experts, has a brilliant future ahead of it. About 5,000 tons of good grade milling ore is ready on the surface to feed the mill, and there is ore enough in sight inside of the mine to insure dividends for the next generation.—*Mexican Trader*.

Batopilas has yielded \$300,000,000 and Santa Eulalia or Chihuahua El Viejo, from 1710 to 1800, nearly \$400,000,000, and since then has continued producing 2½ millions annually, until the work was stopped. Five years ago the work was recommenced in this lode, and in 1896 there were taken out of it 32,000 tons of metal for exportation. In 1897 100,000 tons were exported.—*Enterprise*.

Mining and Transportation of Ores.

The June issue of *Mines and Minerals* of Scranton, Pa., has the following very interesting article on some of the methods practised in British Columbia and the conditions of Geography and climate, which necessitate them, written by Wm. M. Brewer of Victoria, B.C.

There are several interesting features connected with mining in British Columbia, and some among them peculiar to this northern latitude. Climatic conditions must necessarily influence operations, and for reasons which I will explain later, the winter season is, at present, the period when the mines in the Slocan and Kootenay districts are most extensively operated, and when the bulk of the ore is shipped.

Nature has provided highways for travel through this northern country, which have aided the development of the mountain districts to a wonderful extent. I refer to the occurrence of navigable lakes and rivers, by means of which prospectors have been enabled to explore a country that would otherwise be almost inaccessible, because of the mountain ranges and heavy timber. A reference to the map of the district will readily demonstrate how useful have been these waterways in connecting the different districts, and to how great an extent have the railroad companies been assisted in opening up communication.

Leaving the Canadian Pacific Railway at Revelstoke, 379 miles east of Vancouver, you take a branch road 27 miles to Arrowhead, where the Columbia river enters. The upper Arrow lake which extends nearly due south from that point, a distance of about 30 miles, and an average width, nearly uniformly maintained, of about two miles. From its southern extremity the river, after flowing a distance of 18 miles enters the lower Arrow lake. This has a length of 57 miles, but is not as wide as the upper lake. This entire system of waterways is navigated by stern-wheel steamers, which sail in connection with the trains on the Canadian Pacific main line. East from these lakes is the Slocan lake, which forms a link in the chain of communication between Nakusp and at the lower end of the Upper Arrow lake, Sandon the main camp of the Slocan district, and Nelson the chief town in the West Kootenay district, are situated on the east shore of the west arm of the Kootenay lake. This lake in its turn forms a highway for travel through both the east and west Kootenay districts, as the main line extends about 30 miles in either direction, northerly and southerly, from the point where the west arm empties into it.

To the westward from the Arrow lake occurs the Okanagan lake, which is connected with Canadian Pacific main line by a branch from Sycamore to Vernon. A railroad has been projected from Penticton at the southern end of this lake easterly through the Boundary mining district, to intersect the Trail Creek West and East Kootenay districts and connect with the Canadian Pacific main line at Dunnmore in Assiniboina.

The territory enclosed by these connecting highways comprises that mineral section of British Columbia, which produced during 1897, gold, silver, lead, and copper ores to the value of \$6,929,299, and which in 1890 was practically a wilderness, and unexplored by the prospector.

One of the most noticeable features connected with mining operations in these districts is the fact that the topography of the country is such as to render possible the working of mines by tunnels and drifts, instead of shafts,

either vertical or incline, as is usually the custom. The large surface area, nearly 52 acres, which constitutes a quartz-lode location, permits such a method of working many claims which would be impossible under the regulations of the United States, where only about 20 acres is the maximum surface area permitted. In British Columbia a lode claim must be located 1,500 feet in length and 1,500 feet in width, with all the corners forming right angles and no rights to follow the dip of the vein beyond the side lines as is the case in the United States. It will be readily seen that with such a width in a mountainous country it is comparatively easy to drift on a vein at several different levels within the side lines, even though the dip should not exceed 30 or 40 degrees. The ability to pursue such a method enables the mine owner to unwater his property by natural drainage flowing through the tunnels, instead of being compelled to install expensive pumping plants.

Another advantage gained is in being able to tram ore and waste through the tunnels instead of erecting a hoisting plant. A great saving in the expense of working is also made by being relieved of the expense of sinking deep shafts, either vertical or inclined.

In the Silver King mine near Nelson, which I visited lately, the economy of being able to work with tunnels was very clearly demonstrated. The workings are 400 feet vertical depth, comprising four tunnels run in from different levels; these are all connected by overhead stoping, and the ore mined from the higher levels drops to the lowest through chutes, whence it is discharged into the trams, and transported to the station of the aerial tramway. In narrow stoping an advantage is gained by affording an opportunity to do underhand stoping and allowing the ore to fall down through an upraise to tram level.

There are but very few mines worked in this section by shafts and hoists at the present time, but, of course, as depth is attained, such a system will be found necessary, although, in many instances, it will be found that such methods need not be adopted above 800 feet, and sometimes deeper.

The question of transportation of the ore from the mines, has been quite a serious obstacle to overcome because the mountain slopes are so precipitous. The ore belonging usually to the smelting variety, being either silver, lead and copper, or gold and copper, has to be hauled to either the nearest railroad station or lake-dock, often five miles or more distant, for shipment to the smelter. The camps are comparatively new, consequently but very few wagon roads have been built, the miners contenting themselves with the opening up narrow pack trails of the switchback variety. By these they are enabled to pack the ore down the mountains in the summer, using mules or horses and loading from 200 to 300 pounds on an animal which is quite expensive.

The deep snow in the winter affords an opportunity to "rawhide" the ore, by which means an animal can haul from one to one and one-half tons. This system of haulage is quite unique, and can only be practised in countries where the snow is deep. The hide of a steer is used. This is spread out with the hair side down, the sacks of ore are piled on to the skin and kept in place by the legs and sides being folded over the sacks and laced across with rawhide thongs, the tail and head also being fastened together. A log chain is passed around the load to act as a rough lock and check it from sliding too fast

down the slippery trail. A singletree is fastened to the head-end of the hide, to which a horse is hitched. The trail is broken on such a grade as to compel the horse as it travels to pull a little, which, of course, steadies the load. In the rawhide train, which consists of a sufficient number of animals to transport the daily output of the mine at one trip, there is one man to look after three or four animals and prevent accidents liable to occur by reason of a horse or mule making a mis-step into the soft snow. As this is anywhere from six to twelve feet deep and sometimes even deeper, and as the trails are nearly always along the mountain sides, of course a mis-step may be followed by the precipitation of animal and load hundreds of feet down the gulch below.

Because of the economy of this system of transportation when compared with packing, is the reason why the owners of mines in British Columbia prosecute work more actively during the winter than summer months.

During the spring usually all hauling is suspended because of the danger from slides, for when the accumulated snow on the sides of the mountains commences to melt, the water runs under it down the mountain causing the entire mass to slip and, without warning, slide down carrying with it timber torn up by the roots, houses, or anything in its path.

Gradually aerial cable haulage is being adopted wherever practicable and there are already several of both the Hallidie and the Bleichert pattern in use. Some of these are of considerable length; that at the Silver King mine at Nelson being 4½ miles; one at the Payne mine at Sandon over 3,000 feet in length, besides one projected at the Reco mines near Sandon 9,993 feet in length, with one spane 2,750 ft. long, 560 ft. above surface.

At the Silver King the Hallidie pattern is used, and, although an elevation of 4,000 feet is gained in the 4½ miles, the attempt was made to install the cable in one section, but afterwards was found necessary to erect a midway station, thus making two sections. The length of the spans average about 400 feet, and the carrying capacity is about 300 tons daily.

At the Fern gold mine near Nelson, the mouth of the main tunnel is about 1,200 feet vertically above the ore bins in the top story of the stamp mill. A gravity tram track has been built on trestlework with a 52 per cent. grade to transport the ore from the mine. It was necessary because of deep snow to build these trestles about 12 feet above the surface of the mountain side, but it works splendidly, the loaded car pulling up the empty one, and making the trip in 2½ minutes, the length of the track being about 2500 feet, and capacity of tram about 3,000 pounds.

The methods of timbering usually practised in the Slocan and Kootenay districts in the stopes is to set stulls, and where necessary put in lagging; but at the Silver King mine where some of the stopes are over 40 feet wide, and the vein dips about 45°, square sets are used 8 feet 6 inches high, the timber being 12"x12"; these are built to follow up the stope, and the ore taken out clean, the top set catching up the bottom set in stope above.

Whenever an opportunity presents itself through taking out waste rock, this is used to fill in, and the timbers are taken out to be used elsewhere. By following this system the cost of timbering is high, but this is offset by mining all the ore, and leaving no pillars, which is quite an important feature because the ore is high grade in silver, lead, and copper.

Copper Mining on Lake Superior.

(From the Western Mining World.)

The Calumet and Hecla Mining Company, proprietors of the richest copper mines on the face of the earth, employ upwards of five thousand men. The monthly pay roll reaches the enormous sum of \$400,000. Its annual receipts average \$14,000,000, from which dividends at the rate of \$40 per share are annually declared. The total dividends paid by the company, since its organization in 1867, amount to over \$52,000,000. The total receipts of the company to date amount to more than \$385,000,000.

The belt of the Calumet conglomerate lies in township 56, north of range 33, west of the meridian of Michigan. Overlying the vein is a cupriferous amygdaloid rock, while its floor or footwall is composed of trap rock. The first original opening to discover the vein and determine its value was made in the latter part of August and the first ten days of September, 1864, under the superintendence of Mr. John Hulbert. The report of the discovery of the Calumet conglomerate was made by Hon. Edwin J. Hulbert to a Mr. Weeks, secretary of the Hulbert Mining Company, on the 10th day of September, 1864. The first barrel of conglomerate was shipped away on September 11 of the same year, when it was sent to Boston parties to test the truth about the vein carrying 4 per cent copper.

The first active mining by the present company was begun in 1867, in which year the initial shipment of 768 tons of copper was made. From that year the product of the great mine kept on increasing, till now the annual shipment has reached the enormous weight of 96,000,000 pounds of copper.

To illustrate the position which this company holds on the copper market, it may be mentioned that, of the 65,870 short tons of copper mined on the Lake during 1869, the Calumet and Hecla produced 39,220 short tons, or more than one half, and taking the combined product of all the Lake Superior mines since 1856 up to the present year, we find that the Calumet and Hecla has produced two-thirds.

The conglomerate formation in northern Michigan, extending from Portage Lake northwesterly to Keweenaw point, and thence across the great Lake Superior to Ontonagon, is a conglomeration of pebbles in solid form, with an intermixture of pure native copper.

The method employed in mining this vein is as follows: The shafts proper, which reach to the bottom of the mine, are timbered from base to summit, pine timber being used clear through. Levels are uniformly ninety feet apart, which afford access to the different parts of the mine. Through these levels the copper rock is brought to the main shaft by tram cars, that switch to and from the different openings. At the intersection of each level the ore is dumped into the skip, which runs up and down the main shaft at a speed of 600 feet per minute. At the summit the skip rises to the top of the rock house, where the ore is automatically dumped into the ore crushers, thence into the ore cars, whence it is carried to the mills for treatment. The vein is punctured by diamond drills, the average depth of each hole being five feet.

In the Calumet and Hecla mine some seventy-five drills are operating and they blast twice a day. During the forty years of mining on the conglomerate the bed, which averages 12 feet, has never lost its width, while the thickness ranges from 15 to 25 feet. The width and thickness of the amygdaloid vein,

however, is very uncertain. Sometimes they are found to measure 25 feet across, while at other times but a few inches. The conglomerate is a dull red in color, while the amygdaloid is a dirty gray.

The characters of both lodes are such that the most economical way to mine them is by slopes. By slopes is meant inclining toward the vein and under it near the footwall, and working obliquely around it.

The Calumet and Hecla stamp mill, the largest of the kind in the world, is situated at Lake Linden. There are practically two mills in one, of eleven ball heads each, and having a capacity of 6,000 tons conglomerate per day. The metal is found deposited in the rock in all possible forms.

The separation of the copper from the rock is effected by passing the stamped rock over a system of jigs, whereby the sand, by its less specific gravity, is floated off into a steady current of water, and the copper being the heavier, settles and falls through the sieves. One line of jigs succeeds another, over which in succession the copper which has just passed through a previous set of sieves, is made to pass, and the sand which is sustained in the water is carried away by the current of water to the lake by a system of sand wheels and launders. The number of jigs and the velocity of the current are so regulated as to secure the desired separation, with very little loss of copper.

(To be Continued.)

▷ MINING LAW. ▷

All questions and disputes concerning mining law, if addressed to the JOURNAL, will be answered under this heading by T. M. JEFFERY, mining attorney. The latest important court decisions on mining cases will also be given.

(1.) I own a ranch of fifty acres, and leased the same to a party, giving him the exclusive right to bore for oil and reserved the surface for farming purposes. If the boring was successful, he was to have a lease for five years, if not, at the end of six months the land was to revert back to me. Six months have already passed since he commenced work under the lease, and he has not been successful. He now claims he has one year in which to complete his work. What is my remedy, he has possession?

(ANS.)—Your remedy is by an action of ejectment in the Superior Court. You can put him off the land. A case very similar to yours is found in the 63 Penn. State Reports, page 397.

(2.) I hold a bill of sale of an unpatented mining claim. Is it any good?

(ANS.)—You do not say what state your mining claim is located in. I assume it is in California. A bill of sale, not under seal, was held in case of Clark vs. McElvy et al., 11 Calif. 154, to be good to convey the interest of the vendor. If possession was given at the same time, I think there is no question about it.

The Supreme Court of Colorado has held that a verbal agreement of sale, accompanied by possession, is a good transfer of title of an unpatented mining claim.

The same question was passed on in this state, in 46 Cal., 190. A mining deed is the proper conveyance for an unpatented claim.

(3.) Is notice to a director of a mining company notice to the company sufficient to bind the company?

(ANS.)—Answering your question in the general way in which it is asked, I will say no; but there may be circumstances under which notice to a director is notice to the company, as notice given to a director at a

meeting of the board of directors will bind the company.

(4.) Can the president of a mining company foreclose a mortgage on the property of the company while he is president?

(Ans.)—Yes. The same as any other person.

(5.) Can one who is not a citizen of the United States patent a mining claim?

(Ans.)—No. An alien can neither locate, own or patent an unpatented mining claim.

(6.) Is there any provision made by the U. S. government to assay minerals?

(Ans.)—No, not for private parties. This is entirely an individual matter.

(7.) Myself and three others own a lode claim, and a conflicting claim has advertised to patent a portion of our lode. Only one of the owners of our claim is a resident of the state. I understand it is necessary to adverse the other claim. Can I do this, or must all the other owners join with me?

(Ans.)—You can file the adverse on behalf of yourself and co-owners.

PERSONAL NEWS ITEMS

C. GILBERT WHEELER, of Chicago, Ill., who for twenty-one years was Professor of Chemistry of the University of Chicago, is in San Diego county, California, examining mining properties. He intends to visit the International Mining Congress at Salt Lake, Utah, next week.

JEROME POST and H. M. SWAN left Park City, Utah, last week for Mexico to accept positions as amalgamators in the mills of the Esparanza Mining company. The company's works are at Fultenango, Estado de Mexico.

DR. B. O. WERN of Los Angeles, of Hard Cash mine fame has become identified with a free gold production in the "Mother lode" in Tuolumne county, which gives promise of big results at an early date.

ARTHUR WORTH, chief mechanic for the Old Dominion Copper Mining and Smelting company, left Globe, Arizona, last week for Alameda, Cal., where he has come into possession of property, through the death of his father.

DR. W. LILLINGSWORTH of Chicago, who has spent the season in Los Angeles, has returned to his home. He acquired interests in gold near Prescott, Arizona, which run from a trace to \$50 per ton, free gold.

M. F. WYNN and **JOHN OLDHAM** left Park City, Utah, for the Lewiston gold district of Wyoming on a several months prospecting trip.

E. L. MONTGOMERY has been appointed Supt. Utica mine, Angels, Cal.

STEPHEN A. DORSCH, formerly United States Senator from Arkansas, and now operating the Piacho gold mines in San Diego County, Cal., has been visiting Denver, Colo.

SECRETARY OF THE INTERIOR BLISS expects to be present at the International Mining Congress at Salt Lake City, Utah, next week.

GEORGE B. CLARK, manager of several silver and lead mines near San Luis Potosi, Mexico, has been spending a few days in Pittsburg, Pa.

W. R. CHADBURN, Gen. Mgr. Mikado mine, Leadville, Colo., is examining the Lindsay mine, Mayhert, Cal., with a view to bonding it for his company.

J. C. PORTER of St. Louis, president of the Hope Mining Company, has been examining the company's property at Phillipsburg, Mont.

Ross B. BROWNE, accompanied by R. MCKENZIE and Karl Hoffman, is examining the German mine, near Washington, Cal.

AUG. R. MYRER, president of the Consolidated Kansas City Smelting and Refining Company, was a visitor to Leadville last week.

R. A. F. PENNROSE, Pres. Commonwealth, Ariz., G. M. Co., who recently bought the Jupiter mine, Cochise Co., Arizona for \$75,000, is examining mining property at San Bernardino, Cal.

I. BAER has returned to Leadville, Colo., after an absence of some weeks looking after his interests in Mexico.

THE MARKETS.

NEW YORK, June 22d, 1898
The following are the Silver, Copper and Lead quotations for the last two weeks:

	SILVER.	COPPER.	LEAD
June 9	53½	11.80	3.60
10	57½	11.80	3.60
11	58½	12.00	3.60
12	58	12.00	3.60
13	58	12.00	3.60
14	58	12.00	3.60
15	58	12.00	3.60
16	58	12.00	3.60
17	58	12.00	3.60
18	58	12.00	3.60
19	58	12.00	3.60
20	58	12.00	3.60
21	58	12.00	3.60
22	58	12.00	3.60

The market has lapsed into a quiet state. Orders are moderate, and the disposition is to buy at current rates only as necessities demand.

The United States Assay Office in New York reports the total receipts of silver at 157,500 oz. for the two weeks ending June 18.

COPPER.

The demand has continued rather poor and some of the producers evidently become tired of waiting, with the result that rather lower prices have again been accepted for all descriptions of copper. While some of the larger Lake companies are still holding out for 12c.

For electrolytic copper we have to reduce to 11.35@11.45c. for cables, wire bars or ingots, and 11.15@11.25c. for cathodes.

LEAD.

A very active business has been done at gradually rising prices. Very little

lead could be obtainable for either prompt or future shipment, and under the circumstances the market closes at its best with a very strong tendency at 8.90c. New York. In the West also a large business was done, and sales are reported in St. Louis at 3.77½c.

SPLITER.

The good consumptive demand continues and the market is rather firm at 14c. @4.50c., St. Louis, and 4.75c. New York. Spot spliter is rather scarce, and refiners have great difficulty at present in meeting their obligations.

ANTIMONY.

Antimony continues strong, and we quote Cookson's 9½c.; Hallett's, U. S. Star and Japanese, 10c.

NICKEL.

Business still continues on unchanged lines and no alteration in prices can be reported. We quote for New York ton lots 33½c. and 38c. per lb and for smaller orders 35½c. and 38c.

TIN.

Prices in New York are, if anything, just slightly below the price at which tin can be laid down on this side. We have to quote for both spot and futures 15½c. @15¾c.

PLATINUM.

Prices are now quoted at \$15 and \$16 per oz., New York. The London quotations are 58 @ 60s per oz. Supplies are not large and prices are firm. For chemical ware, best hammered metal, Messrs. Eimer & Amend of New York furnish the following quotations: In lots of 250 grams or more, 56c. per gram; in lots of 100 grams or more, 57c. per gram; less than 100 grams, 58c. per gram; unman-

ufactured platinum will be supplied in same quantities at 2c. less per gram.

POTASSIUM CYANIDE.

Purified, 98@99 per cent., in cases of 12 lb. at 32c. per lb. in 5, 10, 25 and 50 lb. tins at an advance.

QUICKSILVER.

The New York quotation are at \$43.00 per flask.

The London price is £7. 12s. 6d. per flask.

POWDRR.

The market at San Francisco is fine with the current quotations.

The quotations are as follows:

For Hercules No. 1, from 11½c. to 17½c., according to strength and quantity. No. 2, from 9c. to 11c., according to strength and quantity.

COKE.

The coke market has been quite dull the past week, and entirely without features of interest.

IN CAR LOTS, ST. LOUIS.

Connellsville fdv coke 72-hr. frv \$1.85
New River, \$1.00 Poconos \$1.00
Crushed..... \$1.00

Gas works coke, lump, per bushel 10

BORAX.

The San Francisco market in Borax is firm with a good demand.

The market is quoted as follows:

Refined, in carload lots, in barrels..... 24
Refined, in carload lots in sacks..... 24
Powdered, in car lots..... 62
Concentrated, in car lots..... 62

THE MINOR METALS.

Quotations are given below for New York delivery:

Aluminum:	
No. 1, 98 per cent. ingots, per lb.	3.64c
No. 2, 90 " " " "	3.64c
Gilded sheets, per lb	3.64c up

CHLORATE OF POTASH.

Chlorate of potash is quoted at \$11 and \$12 per 100 lbs.

CHLORIDE OF LIME.

English prime brands \$1.75@\$1.95; ordinary, \$1.60@\$1.75; Continental, \$1.50@\$1.60; and French \$1.35 per 100 lbs.

Acids.

The market for the following acids lacks interest; has practically been at a standstill, through prices are pretty steady.

SMITH & IRVING,

(FORMERLY, W. T. SMITH & CO.)

Gold Refiners and Assayers.

Our silver amalgam for replating copper plates is being extensively used by millmen. It avoids the necessity of sending plates long distances to be replated. For sale in small quantities, see per ounce, a reduction being made on all orders over 20 ounces. Experience proves our silver amalgam will catch more gold than when the copper is electrolyzed.

Our Mr. Smith owned and operated Smelting, Refining and Chemical works in Providence, R. I., for over 20 years.

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Courses in Civil, Mechanical, Electrical and Mining Engineering, Metallurgy and Chemistry. Also Classical and Literary Courses. For further information, and for Registers, address, The Secretary of Lehigh University, South Bethlehem, Pa.

SAVE MONEY! FUEL COSTS MONEY



Protect your pipes and boiler with Wm. Kirkfeld's Fossil meal composition, packed in sacks, easy to transport anywhere. Send for facts and figures.

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Cedar Street, New York



LARGEST GASOLINE PUMPING PLANT IN THE WORLD

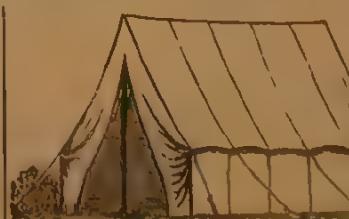
The illustration shows the gigantic pumping plant recently built by the Hercules Gas Engine Works at the Packer Ranch, Colusa Co., 80 h. p. Hercules Engine, pumping 7200 gallons a minute, 27 feet high. Burns Gasoline or Distillate oil. Cheapest power known. Gas, Gasoline and Oil Engines, 2 to 100 h. p. Send for Catalogue. HERCULES GAS ENGINE WORKS, 216 Bay St., San Francisco.

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Aluminum - Nickel, per lb..... 10c
Bismuth, per lb..... 30c
Phosphorus, per lb..... 40c
Tungsten, per lb..... 75c
Tetro-tungsten, 50 per cent..... 80c

Variations in price depend chiefly on the size of the order.

CHEMICALS

There has been no material change in demand for heavy goods.

Quotations generally are as follows:

CAUSTIC Soda.

Quotations for Caustic soda domestic high test are \$1.50 @ 1.65 per hundred lbs.

ALKALI.

Domestic, 58 percent., 56c. @ 60c., foreign 66c. @ 60c. from dock as to style of package.

CARBONATED SODA ASH.

58 per cent., 90c. and 95c. per 100 lbs. basis 48 per cent.

DIA CARBONATE OF SODA

English, \$2 12½ @ \$2.25 per 100 lbs. American, bulk \$1.25 and \$1.50 per 100 lbs. according to brand.

SAL SODA.

For domestic, 50c. per 100 lbs. less usual discounts; English, 62½c. and 65c. Concentrated sal-soda, \$1.60 @ \$1.65 per 100 lbs.

CHLORATE OF POTASH.

Chlorate of potash is quoted at \$11 and \$12 per 100 lbs.

CHLORIDE OF LIME.

English prime brands \$1.75@\$1.95; ordinary, \$1.60@\$1.75; Continental, \$1.50@\$1.60; and French \$1.35 per 100 lbs.

THE MINING AND METALLURGICAL JOURNAL

Prices are per 100 lbs. in New York and vicinity in lots of 25 carboys or over. Quotations are as follows: Acetic acid, commercial No. 8 \$1.40 @ \$1.55, distilled, 28 per cent., \$2.00 @ \$2.15. Muriatic acid, 18 per cent., 1.10 @ \$1.75. 20° \$1.20 @ \$1.87 1/2, 22° \$1.35 @ \$2.25 according to make and quantity. Nitric acid, 36°, \$1.50 @ \$1.75, 38° \$3.75 @ \$4.62 1/2, 40° \$4.00 @ \$4.57 1/2, 42° \$1.62 1/2 @ \$5.25. Oxalic acid, \$6.50 @ \$7.00. Mixed acids, according to mixture. Sulfuric acid, 66 per cent., \$1.10 @ \$1.75. Chamber acid, 50° \$11.50 @ \$12 per ton at factory. Blue Vitriol, \$8.62 1/2 @ \$4.12 1/2 according to grade and order.

BRIMSTONE

Demand continues moderate. No arrivals are noted, and prices are: Futures lower and the quotations for cargoes to arrive is \$24 per ton and for best unmixed seconds with \$21.50 named for thirds.

MURIATE OF POTASH.

We quote per 100 lbs. on basis of 80 per cent., as follows: New York and Boston, \$1.78 for 80@85 per cent., and \$1.81c. for 95 per cent.; Norfolk and Philadelphia, \$1.76 1/2 for 80@85 per ct., and \$1.79 1/2 for 95 per cent.; Charleston, Savannah, Wilmington, N. C., and New Orleans, \$1.78 1/2 for 80@85 per cent., and \$1.81 1/2 for 95 per cent. All for lots of 50 tons and upward.

KAOLIN.

Invoice weights as taken at port of shipment per ton of 2,240 lbs. testing 12.4 per cent. actual potash, equivalent to 23 per cent. sulphate of potash, \$8.55 @ \$8.80 for New York and Boston; \$8.90 @ \$9.15 for Norfolk, and Philadelphia; and \$9.05 @ \$9.30 for Charleston. Sa-

vannah, Wilmington, N. C., and New Orleans.

NITRATE OF SODA.

Prices continue a little uncertain, with rather a downward tendency. The quotations are unchanged at \$1.87 1/2 @ \$1.90 per 100 lbs. for spot, \$1.77 1/2 for July arrivals, \$1.70 for August, \$1.65 1/2 @ \$1.67 1/2 for September, and \$1.62 1/2 @ \$1.65 for October-December, inclusive.

FINANCIAL NOTES.

The statement of the United States Treasury, on Thursday, May 26th, shows balances in excess of outstanding certificates as below, comparison being made with the statement for the corresponding date last week:

	June 16	Changes
Gold	\$1,103,110	\$2,100
Silver	2,421,110	-1,200
Treasury Notes, etc.	2,421,110	-1,200
Totals	\$5,944,320	\$2,100

Treasury deposits with national banks amounted to \$28,645,291, an increase of \$124,501 during this week.

Average Monthly Prices of Silver.

In New York per ounce Troy, from January 1st,

1896, and for the years 1895 and 1894

Month 1896 1897 1896

January... 64.7 64.7 62.13

February... 65.0 64.7 65.17

March... 64.0 64.0 65.00

April... 64.02 64.02 67.92

May... 64.02 64.02 67.78

June... 64.10 64.10 68.75

July... 64.01 64.01 68.75

August... 64.19 64.19 67.61

September... 64.24 64.24 65.61

October... 64.27 64.27 66.15

November... 64.91 64.91 65.91

December... 64.61 64.61 65.21

Year... 64.59 64.59 67.75

Total 1897 14,234,657 4,439,355 17,672,722

Specie shipments by water from San Francisco for the five months ending May 31st were as follows:

Gold Silver Totals

Hong Kong \$19,448 \$2,102,106 \$2,121,754

Shankhan... 106,578 17,572

India... 115,400 15,400

Honduras 170,000 27,000 17,000

Tristan 2,411 2,411

Central America 22,424 82,740 105,165

Total foreign \$2,824,444 \$3,038,755

New York 15,900,555 92,326 15,900,555

Totals 1897 14,234,657 4,439,355 17,672,722

The preliminary statement of the Bureau of Statistics of the Treasury Department shows that merchandise exports from the United States continued heavy in May, reaching a total of \$110,239,206, or \$32,367,930 more than in May, 1897. The imports for the month were \$53,258,847. For the eleven months of the fiscal year from July 1st to May 31st, the statement is as follows:

Gold and Silver Exports and Imports.

All United States ports, April, 1898, and years from January 1st, 1898 and 1897.

Coin and Bullion Exp. In Ores Exp. Imp.

Gold \$1,103,110 \$13,119,383 1,000 \$169,517

Silver 2,421,110 50,077 72,141 2,482,204

Treasury Notes, etc. 2,421,110 93,068 1,788,903

Totals 5,944,320 127,595 1,080,851

Gold 20,207,255 112,699 8,047,223

Silver 22,282,7 3,115,72 1,080,851

Totals 42,489,7 14,315,72 1,080,851

	Exports	Imports	Excess, exports	Add excess of exports, silver	Total	Deduct excess of imports, gold	Net apparent balance
	\$97,800,522	\$1,111,101	\$96,689,421	\$2,054,641	\$94,635,131	\$51,889,018	\$42,816,629
	\$70,645,101	\$1,111,101	\$69,533,131	\$2,054,641	\$68,480,480	\$41,816,629	

POSITIONS WANTED

Advertisements of this class containing not more than five lines will be inserted for not exceeding three months in any year, free of charge, to all paid-up annual subscribers.

Others than above \$100 per month will be charged.

Advertisements not accepted for less than one month.

WANTED, by a young experienced man, a position as quartz mill man, one who can keep mill running.

Audress, A. R. CHARLESWORTH,
LOCKFORD, CAL.

WANTED, by a young man, a position as Assayer, etc.; experienced, competent and has a good knowledge of all metallurgical operations. Good references.

Address, T. K. JOURNAL OFFICE,
Stimson Block, Los Angeles, Cal.

WANTED—An experienced Engineer with practical knowledge of management of dynamos and electric lights. Also wanted an Assayer with practical knowledge of silver metallurgy. Address with references
VEKOL MINING CO.,
Vekol, Arizona

FOR SALE!

I HAVE some good gold mining properties for sale at reasonable prices, some developed and some real good properties at Ward, Eldora, Gold Hill, Jamestown, Magnolia, Carbon and Sugar Loaf. Write stating what you want or call on me.

JAMES M. NORTH,
Former County Judge,
BOULDER, COLO.

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Iron and Brass Castings of all kinds, Shoes and Dies, Pumps, Engines, Boilers, Stamp Mills, etc., etc. Machinists and Foundrymen.

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PHOENIX, . . . Arizona

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Geologist and Mining Engineer,
Mines Examined and Reported on,
COLTON, CALIFORNIA

A.A. WARREN

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COLTON, CALIFORNIA

Manufactured by the Denver, Col.
Western Chemical Co. For Chlorination, Refining and other processes. Also Muriatic and Nitric Acids, Blue Vitriol, Copperas, Refined Sulphate of Soda, Etc.

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Barometers, Thermometers, Field Glasses, Microscopes and Accessories. Repairing Promptly Done.

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BOUND BROOK, N.J.

Sulphuric Acid

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Best and Oldest Establishment in Southern Cal.

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Cash Returns Made Within Twenty-four hours after receipt of Ore.

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FOR SALE!

One 36"x24" Water Jacket Furnace, Boiler, Engine Blower, Rock Breaker, Scales, Shafting, Pulleys, Belting, Tools and all fittings and fixtures complete and new, built by Frazer & Chalmers; also one 16x42 Hamilton Corliss Engine; one 12x20 double Cylinder Hoisting Engine. Will be delivered f. o. b.

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Chemist to the Board of Health of the City of Spokane. All Assays guaranteed to check with United States Mint.

E. B. VAN OSDEL, A. M.

Assayer and Analytical Chemist

Anything Analyzed.

109 Howard Street, Spokane, Washington

The Baker & Adamson Chemical Co.
MANUFACTURERS OF

Strictly Chemically Pure Acids and Chemicals and Ashless Filter Papers

EASTON, PENNSYLVANIA

MINING STOCK QUOTATIONS

BOSTON

Aetna Con.	—	do rights	55
Allouez	3 28	Gold Coin	1 80
Anacunda	—	Humboldt	4 75
Angold	16 85	Illinoian Steel	80 00
Asa Red	3 88	Lake Sup Iron	—
Atlantic	29 00	Merced	—
Baltic	17 88	Nitroal	75
Bananza	—	New Idria Mg	—
Boston and C.C.	—	Old Dominion	28 00
Boston & Mont'g	21 75	Oceola	55 25
Butte & Boston	22 00	Parratt	22 00
Calmont & Hecla	5 75	Pioneer	5 75
Catalpa	—	Quincy	116 4
Centennial	16 80	Salt Wash	—
Dominion Coal	24 00	Lamack	165 00
Dominion Ref.	118	Herschel	2 80
Franklin	14 75	Wolverine	23 00

NEW YORK

Alamo	03 1	Homestake	29 60
Alice	40	Iron Silver	—
Annette	46	Mexican	30
Best & Belcher	60	Mollie Gibson	19
Blue Rock	06	Ontario	4 50
Bliss	—	Ophir	—
Crown Point	65	Pharmacist	10
Con. Cal. & Va.	—	Plymouth	—
Cripple Creek Con.	08 1	Quaker	3 00
Deadwood	—	Standard	11 00
Favorite	11 25	Sher. Nevada	—
Golden Fleece	45	Union Con.	—
Gould & Curry	45	Yellow Jacket	—
Hale & Norco	—	—	—

COLORADO SPRINGS STOCKS

Alamo	02	Jack Pot	03 1
Anacunda	52 1	Lexington	—
Argentum Juanita	28	Lilie	90
Bob Lee	—	Magnet R	008 1
Credde & C. C.	08 1	Mariion	—
C. C. Consolidated	09	Matoa	16
Des Moines	—	Mollie Gibson	23 1
Elikton Con.	93	Moon A's	74 1
El Paso	—	Mount Rosa	12 1
Favorite	16	New Haven	01 1
Findley	—	Pharmacist	05
Franklin	03 1	Pilgrim C.	—
Golden Crater	—	Portland	89 1

GOLDEN FLEECE & CO., LTD., LONDON, ENGLAND

Golden Fleece	30	Sperman	—
Gold & Globe	—	Theron	—
Hayden	60 5	Trachylo	—
Ing. Con.	66 1	Union Gold	91 1
Isabella	23 1	Work	02 1

LOS ANGELES, CAL.

Amargosa	—	05	Lucky Star	—
Brown Dale	—	07	Magganette	—
East Armagosa	—	60	Mohawk Action	—
Kings Copper	25	Old Dominion	—	
Gold Bug	1 00	Paid Con	1 25	
Grand Central	02	Rand Mt	10	
Iron Mt.	02	Sun Prince	1 50	
Laurel Mt.	02 1	Vai Verde	1 50	
Little Buite	15	Wedge	07 1	

SAN FRANCISCO

Alpha	—	Escherer	—
Alta Con	10	Gould & Currys	21
Andes	09	Hale & Norco	1 85
Belcher	23	Juston	—
Bell & Belcher	27	Mexican	21
Boddie	—	Ophir	—
Bullion	—	Oreman	—
Challenge	20	Potosi	21
Chollar	16	Savage	10
Confidence	85	Sierra Nevada	67
Con. Cal. & Va.	49	Union Con.	49
Crown Point	13	Utah	07
		Yellow Jacket	03

SALT LAKE CITY

Alice	60	Lucky Hill	—
Ajax	31	Mather	—
Alliance	10	Monmouth	1 57 1
Anchor	60	Manfield	—
Buckeye	01 1	Maren	7 00
Bull Heck	5 75	Morgan	—
Cent. Burke	30	Northern Light	—
Chloride Point	91 1	Omaha	—
Dalton	03	Ontario	3 15
Daly	50	Overland	—
Daly West	3 50	Richmond Ana-	—
Dalton & Lark	01 1	conda	02 1
Dexter	1 02 1	Rover	16
Eagle	05 1	Sacra Nento	64 1
Kureka Hill	—	Silver King	18 75
Pearl Aces	07	Snow Con	—
Galena	50	Sunbeam	10
Gemini	50	Sunshine	28
Geyer Marion	88	Swanson	2 12 1
Grand Central	6 85 1	Tawanea	1 28 1
Homeslake	—	Utah	10
Horn Silver	1 26	Utah Con	—
Little Pittsburg	02 1		—

ROSSLAND, BRITISH COLUMBIA

Alberta	05	Joie Mac	—
B. C. Gold King	07	Joie	—
Hoover	10	Jumbo	76
Blue Horse	10	Knight Templar	—
Bunce	07	Kootenay London	19
Butto	05	Land Roi	—
Butto	05 1	Lily May	15
Caledonia Con.	05	Malib	—
California	15	Mayflower	—
Camp Bird	05	Morita	19 1
Celtic Queen	05	Monte Christo	—
Centre Star	24	Mornig Star	08
Colonna	24	Mugwump	05
Commander	18	Neat Egg	—
Deer Park	12 1	Northern Belle	10
Della Coll.	02	Novelt	—
Delaware	12	O. K.	—
Enterprise	20	Palo Alto	05
Florida	02	Phoenix	13 1
Burke Con.	05 1	Plaza	—
Keweenaw Star	05 1	Red Kagle	15
Georgia	10	Red Mount View	—
Gethrude	10	Redd Point	—
Golden Drip	15	Golden Hope	—
Golden Hill	03 1	Golden Red Mt.	—
Grand Prince	02 1	Green St. Rimo	—
Green Western	08	St. Paul	12 1
Hattie Brown	04	Silver Bell	04
High Ore	04 1	Silverine	—
Iron Horse	10	Snow Cross & W. Con.	—
Iron Mask	10	Virginia	12
I. X. L.	10	West L. Ro	00
		White Bear	11

DENVER STOCK REPORT.

Aetna	001 1	Keystone	—
Anaconda	51	Lillie	—
Arcadia	51	Moon A	—
Argentum Juanita	26	Mt Rosa	—
Banner	07	Old Gold	003
Bob Lee	002 1	Peoples	002 1
C. C. Con.	05 1	Pilgrim C.	002 1
E. P. Pan G.	05 1	Pine Creek	002 1
Kings Col.	05 1	Portland	002 1
Kingsville	05 1	Prince Albert	01 1
Garfield Grouse	05	Rhenic	02 1
Gro. Washington	002 1	San Francisco	—
Golden Eagle	34	Specimen	03 1
Gold Con	98	Tamarack	10 1
Gilpin & C. C.	05 1	Union Gold	001 1
Gilpin Mine	004 1	Virginia M.	03 1

Iron Glad	92	Isle of Fortune	002 1
Isabella	26	Isle of May	02 1
Jack Pot	002 1	Isle of Skye	—

MEXICO

Name of Company	State	Price
Allende	Hidalgo	5
Angelito y Concordia	"	21
Angosturas	Guadalajara	210
Arenillo y Anexas	Il. del Rio	210
Asturias y Anexas	Zacatecas	250
Barralon y Cabras	Durango	300
Bartolome de Medina Hidalgo	"	100
Callezina y An.	Zacatecas	30
Candelaria de Pachuca	"	150
Cerro de Chalchihuites	Hidalgo	120
Cerro San Juan y San Ramon	Topo Chico	350
Cerro Colorado	Chihuahua	10
Cerro Senores y An.	Guadalajara	650
Concepcion y Anexas	S. Luis Potosi	250
El Oro	"	10
Empedrado y Ar.	Mexico	1 300
Guadalupe	Guadalajara	180
Huasteca	Santa Ana	100
Laz de Matavillas	Hidalgo	200
Palobello	Zacatecas	150
Purisima de los Con.	"	5
Restaurante	Hidalgo	900
Rosario y Anexas	"	50
San Francisco	Hidalgo	270
San Rafael del Oro	Hidalgo	29
S. Maria de la Paz	S. Luis Potosi	730
Sirena	Durango	80
Sierra	Hidalgo	100
Solida	Hidalgo	250
Sorpresas	Puebla	27
Tirintzad	Puebla	200
Tlaxianguillo	Hidalgo	15
Union	Hidalgo	200
Zaragoza	Vera Cruz	100
Zomelahuayan gold	Vera Cruz	100
Zona Min. de Pozos	Guadalajara	15

NOTE—The above Mexican stocks are figured on the basis of Mexican silver

The Southern California Lumber Co., Elsinore Bldg., Los Angeles, Cal., Chas. Wier Manager, sell

BRANCH OFFICES

1128 E St., SAN DIEGO, CAL.



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New York City

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THE Ingersoll-Sergeant Drill Co.,

AIR COMPRESSOR

Rock Drills AND

Air Compressors

MODERN, DURABLE AND GUARANTEED to do the Work.



ROCK DRILLING

2000 ft. deep

INCORPORATED MINES PAYING DIVIDENDS.

NAMES OF MINES	LOCATION	No. of Shares	Capital Stock	Per Value	Amount of Dividend	Date of Last Dividend	Total Amount Paid in Dividends	Kind of Mineral Produced
Aetna Cons.	California	100,000	\$ 600,000	\$ 5	\$ 10	Sept 1897	\$ 110,000	Q.
Ajax	Utah	300,000	3,000,000	10			1,000,000	G., G., S., L.
Alaska, Treadwell	Alaska	200,000	5,000,000	25	35 ^{1/2}	October, 1897	3,250,000	G.
Alaska Mexican	Alaska	200,000	1,000,000	5	10	Oct., 1897	297,031	G.
Alice	Montana	400,000	10,000,000	25	03	Oct. 1897	1,055,000	G.
Alice	Utah	400,000	10,000,000	25	05	April 1898	1,075,000	S., L., Q.
Anaconda	Montana	1,200,000	30,000,000	25	1 25	May 1897	3,750,000	C.
Anchorage Island	Colorado	600,000	600,000	1	01	Oct 1897	84,000	G.
American Gold	Colorado	800,000	3,000,000	10	02	Aug 1897	273,000	G., S., L.
Atlantic	Michigan	40,000	1,000,000	25	1 00	Feb. 1897	740,000	S.
Bald Butte	Montana	250,000	250,000	1	03	Sept 1897	512,500	G., C., S.
Bangkok C. Bell	Colorado	600,000	600,000	1	01	July 1896	107,510	S., L., C.
Big Six	Colorado	500,000	500,000	1	00 ^{1/2}	April 1897	5,000	G., S.
Boston & Montana	Montana	150,000	3,750,000	25	3 00	Aug 1897	6,275,000	G., C., S.
Bullion Beck and Champion	Utah	100,000	1,000,000	10	50	Mar 1897	2,485,000	G., S.
Bunker Hill and B.	Idaho	300,000	3,000,000	10	05	Oct 1897	324,000	S., L.
Cariboo	British Col	8,000	800,000	1	02	May 1897	156,905	G.
C. O. D.	Colorado	50,000	500,000	1	01	March 1896	25,000	G.
Calumet & Hecla	Michigan	10,000	2,500,000	25	10 00	Oct. 1897	50,860,000	O.
Centennial Eureka	Utah	80,000	1,500,000	50	1 00	Mar 1897	2,010,000	S., L.
Central Lead	Missouri	4,000	400,000	100	1 00	Oct 1897	18,000	L.
Charleston	South Car	10,000	1,000,000	100	1 00	Feb 1897	150,000	-----
Champion	California	34,000	840,000	10	25	Aug 1897	278,200	G.
Chloride Point	Utah	500,000	500,000	1	01	Dec. 1897	5,000	G., S.
Crescent	Utah	24,000	800,000	25		July 1897	290,000	-----
Daly	Utah	150,000	3,000,000	20	25	Mar 1897	2,925,000	S., L.
Deadwood Terra	Dakota	200,000	5,000,000	25	40	June 1897	1,320,000	G.
De Lamar	Idaho	400,000	2,000,000	5	25	Jan 1897	2,250,100	S., L.
Della S.	Colorado	1,000,000	1,000,000	1	10	Jan 1897	60,000	G.
Doe Run	Missouri	5,000	500,000	100	50	October 1897	-----	L.
Dalton and Lark	Utah	2,500,000	2,500,000	1	00 ^{1/2}	August 1896	87,500	S., L.
Elkton Consolidated	Colorado	1,250,000	1,250,000	1	03	Sept 1897	361,960	G., S.
El Paso	Colorado	650,000	650,000	1	01	Aug 1897	5,393	G., S.
Eureka Hill	Utah	10,000	1,000,000	100		-----	1,850,000	-----
Florence	Montana	500,000	2,500,000	5	01	May 1897	132,530	S.
Galena	Utah	100,000	1,000,000	10	05	Jan. 1897	71,000	G., S., L.
Garfield Grouse	Colorado	1,200,000	1,200,000	1	01	Feb. 1897	24,000	G.
Gemini	Utah	6,000	500,000	100		-----	500,000	-----
Geyser-Marion	Utah	300,000	1,500,000	5	02	May 1898	84,000	G.
Golden Eagle	Colorado	1,000,000	1,000,000	1	01	Sep. 1896	10,000	G.
Golden Fleece	Colorado	600,000	600,000	1	01	Feb. 1897	569,179	G., S.
Gold Coin	Colorado	200,000	1,000,000	5	05	Ang 1897	150,000	G., S.
Gold and Globe	Colorado	750,000	750,000	1	3-10	July 1897	61,625	G.
Hecla Consolidated	Montana	30,000	1,500,000	50	50	Feb 1897	2,175,000	S., G., I., C.
Helena & Frisco	Idaho	500,000	2,500,000	5	01	August 1896	475,000	S., L.
Holy Highland	S. Dakota	100,000	10,000,000	100	20	Oct 1897	3,424,918	G.
Holy Terror	S. Dakota	300,000	300,000	1	03	Sept 1897	18,000	G.
Homestake	Dakota	125,000	12,500,000	100	25	Oct 1897	6,431,250	G.
Hope	Montana	100,000	1,000,000	10	10	Nov 1897	732,252	S.
Horn Silver	Utah	400,000	10,000,000	25	05	April 1898	5,120,000	S., L.
Idaho	Brit. Col	500,000	500,000	1	05	Mar 1897	152,000	-----
Iowa	Colorado	1,000,000	1,000,000	1	00 ^{1/2}	Oct 1897	65,000	G.
Iron Mountain	Montana	500,000	5,000,000	10	01	Sept 1897	497,500	S.
(Isabella)	Colorado	2,250,000	225,000	100	00 ^{1/2}	June 1897	270,000	G.
Kearsarge	Michigan	40,000	1,000,000	25	10	Aug 1897	160,000	C.
Last Chance	Brit. Col	500,000	500,000	1	04	Jan 1897	42,000	S., L.
Le Roi	British Col	500,000	2,500,000	5	10	Oct 1897	625,000	G.
Minnesota	Minnesota	165,000	16,500,000	100	1 50	July 1896	3,240,000	E.
Montana Ore Purchasing	Montana	40,000	1,000,000	25	01	October 1897	810,000	-----
Morning Star	California	2,400	240,000	100	8 00 ^{1/2}	Sept. 1897	558,800	G.
Mt. Rosa	Colorado	1,000,000	1,000,000	1	00 ^{1/2}	Oct. 1896	30,000	G.
Mercer	Utah	200,000	5,000,000	25	18	May 1898	1,068,000	G.
Mammoth	Utah	400,000	10,000,000	25	05	June 1898	1,250,000	G., S., C., L.
Moon Anchor Gold	Colorado	600,000	600,000	1	02	Nov 1897	63,000	G.
New Elkhorn	Colorado	300,000	1,500,000	5	24	Sep. 1896	72,000	G.
New York & Hon. Rosario	Central A.	150,000	1,500,000	10	10	Oct. 1897	832,500	S., Q.
Napa	California	100,000	700,000	7	20	Oct 1897	870,000	Q.
New Idria Quicksilver	California	100,000	500,000	5	10	Sept 1897	20,000	Q.
Ontario	Utah	150,000	15,000,000	100	75	Dec 1897	13,542,500	S., L.
Oscoda	Michigan	50,000	1,250,000	25	1 00	June 1897	2,172,500	C.
Parrot	Montana	230,000	2,300,000	10	08	June 1897	1,666,122	C.
Pennsylvania Consolidated	California	51,600	5,150,000	10	05	Sept 1897	20,750	-----
Portland	Colorado	3,000,000	3,000,000	1	01 ^{1/2}	Oct 1897	1,163,000	G., S.
Princess	Colorado	1,000,000	1,000,000	1	00	Feb 1897	45,000	G.
Quincy	Idaho	100,000	2,500,000	25	4 00	August 1897	9,470,000	C.
Rambler-Cariboo	Brit. Col	1,000,000	1,000,000	1	02	April 1897	40,000	-----
Reco	Brit. Col	1,000,000	1,000,000	1	50	May 1897	187,500	S., L.
Sacramento	Utah	1,000,000	5,000,000	5	00 ^{1/2}	June 1898	35,000	G.
Small Hopes Consolidated	Colorado	250,000	5,000,000	20	10	Mar 1896	3,275,000	S.
South Swansea	Utah	150,000	150,000	1	05	April 1898	90,000	S., L.
Standard	California	200,000	20,000,000	100	10	Sept 1897	3,757,868	G., S.
St. Joseph	Missouri	250,000	2,500,000	10	15	Oct 1897	21,000	L.
Silver King	Utah	150,000	3,000,000	.20	25	June 1898	1,575,000	S., L., G.
Slocan Star	Brit. Col	2,000,000	1,000,000	0.50	05	Mar 1897	350,000	-----
Smuggler Union	Colorado	50,000	6,000,000	100	1 00	Oct 1896	150,000	G., S.
Swansea	Utah	100,000	500,000	6	05	June 1898	100,000	S., L.
Tom Boy	Colorado	200,000	2,000,000	10	20	March 1890	410,000	G.
Tamarack	Michigan	60,000	1,500,000	15	3 00	June 1897	4,950,000	C.
Union	Colorado	1,250,000	1,250,000	1	01	June 1896	73,000	S.
Utah	Utah	100,000	1,000,000	20	01	Dec. 1897	177,000	G., S.
Utah Consolidated	Utah	30,000	150,000	5	02	Sept 1890	3,000	S., L.
Victor	Colorado	200,000	1,000,000	5	10	March 1897	765,000	G.
Western Mine Enterprise	Montana	500,000	500,000	1	10	Mar 1897	12,000	-----
War Eagle	British Col.	500,000	500,000	1	06	October 1896	187,000	-----

S, Silver.

G, Gold.

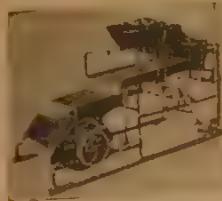
L, Lead.

O, Copper.

Q, Quicksilver.

I, Iron.

B, Borax.

**KLONDIKE MACHINE.**

If you are going to the Klondike or any other country to placer mining or your placer machine will not make a clean saving of the fine gold, as well as the coarse. The material is separated into four different grades in passing through the machine, a coarse screen is arranged over the hopper to cut out the rocks and gravel; it is fed regularly on to the screen below; a series of riffles are arranged at the end of this screen to catch any coarse gold that will not pass through the screen, the material then passes over the riffle table (steel Hungarian riffle) on to the screen over the amalgamating plate and cylinder, this fine screen cuts out all the coarse gauges allowing nothing but the water and fine material to pass through. An amalgamator avoids any scouring whatever, the screen over the cylinder has a side which the table and hopper can be set at any pitch, each separately, can be run fast or slow or suspended, work being done, this machine is equal the machine for dry countries as it requires very little water. By attaching one of our pumps the water can be used over and a large amount of work can be done with a small amount of water, the pump will lift water 10 feet from a stream or well. As a gold saver this machine is unequalled, it is light, simple, and durable, can be packed, the heaviest piece weighing 50 pounds, built almost entirely of metal, three sizes, price \$160, \$300, \$450, capacity 10, 25 and 40 tons; weight 125, 400, and 500 pounds. **PACIFIC MINING MACHINERY CO.**, 129 First St., San Francisco, Cal. Send for full descriptions.

screen over the cylinder has a side which the table and hopper can be set at any pitch, each separately, can be run fast or slow or suspended, work being done, this machine is equal the machine for dry countries as it requires very little water. By attaching one of our pumps the water can be used over and a large amount of work can be done with a small amount of water, the pump will lift water 10 feet from a stream or well. As a gold saver this machine is unequalled, it is light, simple, and durable, can be packed, the heaviest piece weighing 50 pounds, built almost entirely of metal, three sizes, price \$160, \$300, \$450, capacity 10, 25 and 40 tons; weight 125, 400, and 500 pounds. **PACIFIC MINING MACHINERY CO.**, 129 First St., San Francisco, Cal.

**The Pulsometer Steam Pump****"THE MINER'S FRIEND"****Often Imitated--Never Equaled****Over 20,000 In Use****RECENT IMPORTANT IMPROVEMENTS**

The Handiest, Simplest and Most Efficient Steam Pump for General Mining Quarrying, Railroad, Irrigation, Drainage, Coal Washing, Tank-filling and for Pumping Back Liquids heavily impregnated with sediment. Muddy or gritty Liquids handled without injury to the Pump.

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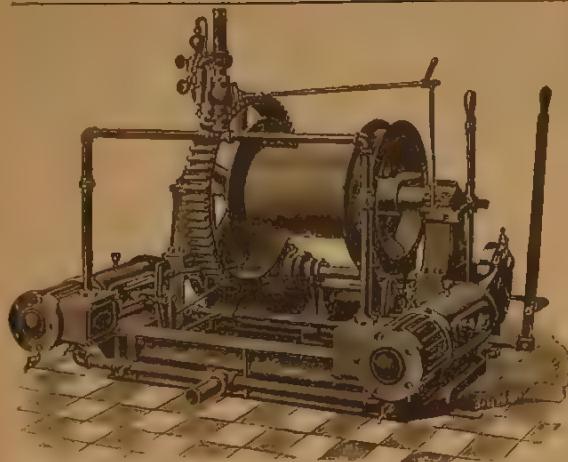
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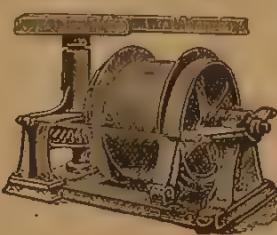
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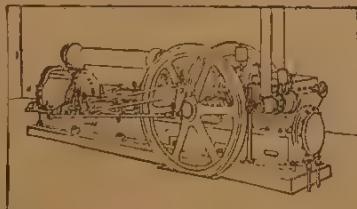
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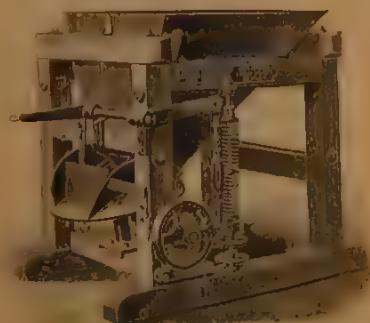
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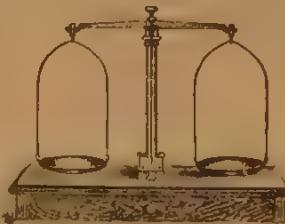
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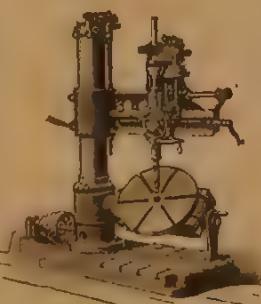
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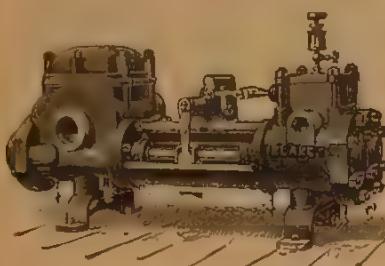
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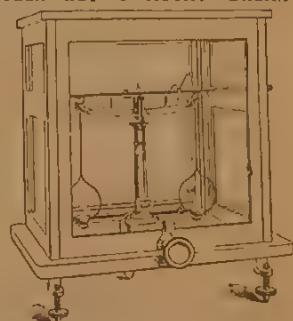
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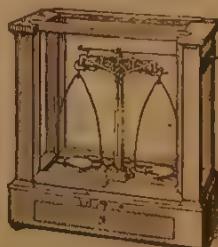
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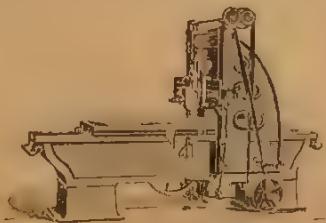
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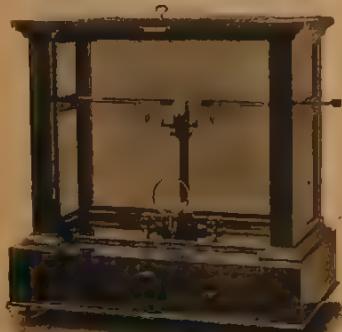
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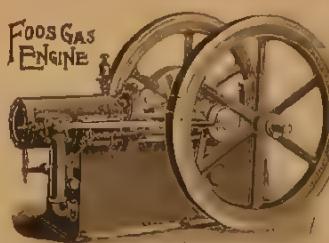
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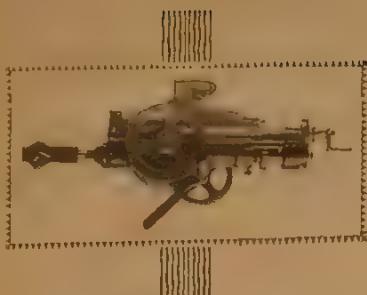
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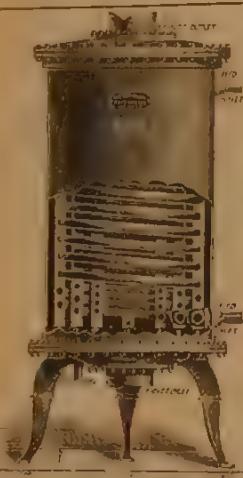
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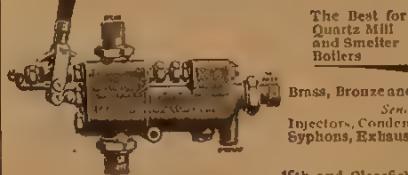
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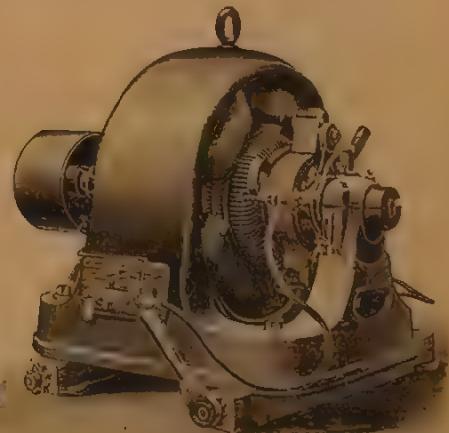
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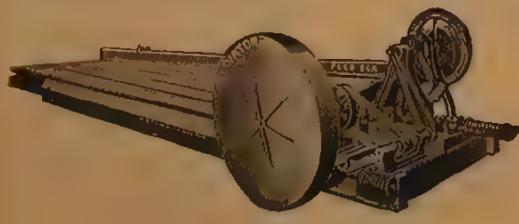
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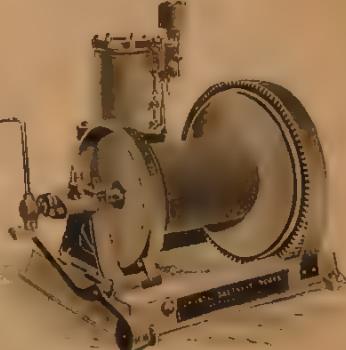
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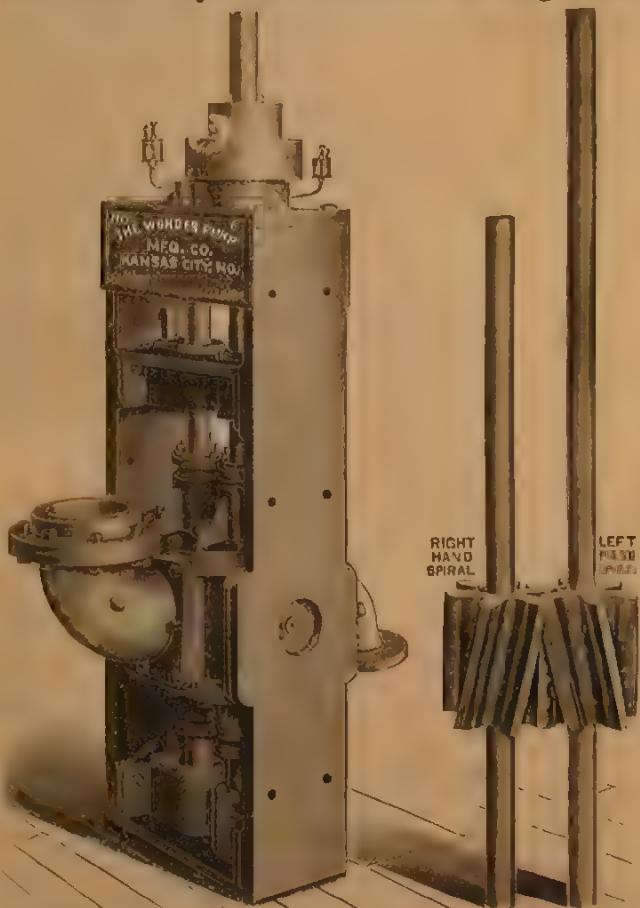
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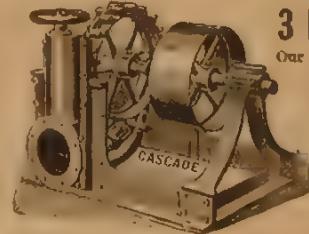
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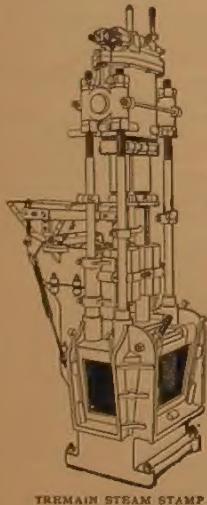
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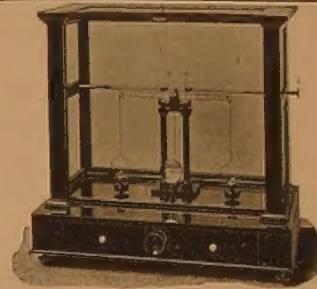
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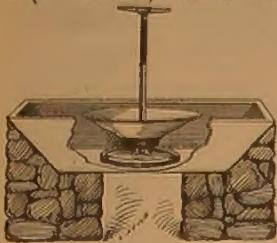
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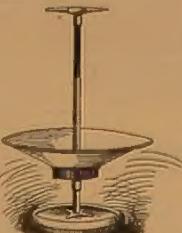
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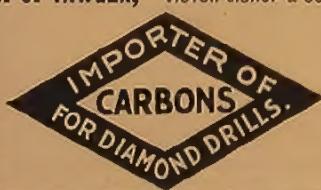
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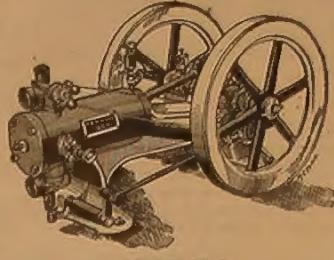
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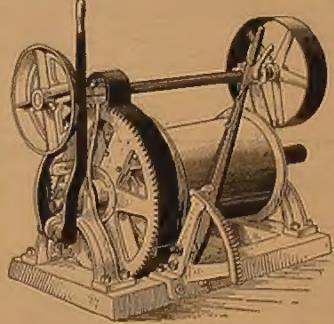
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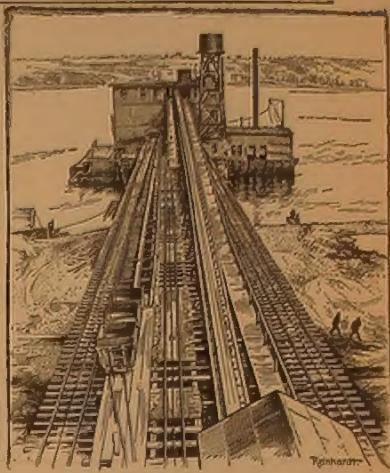
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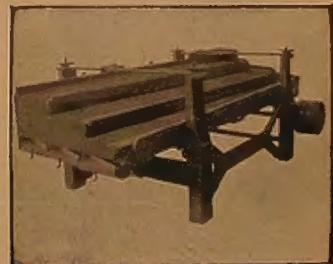
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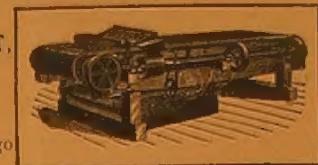
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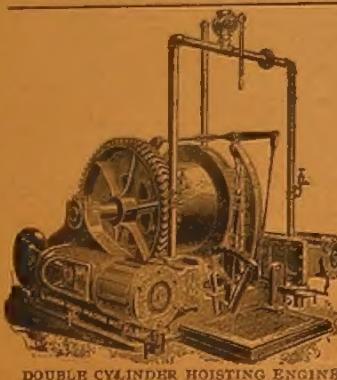
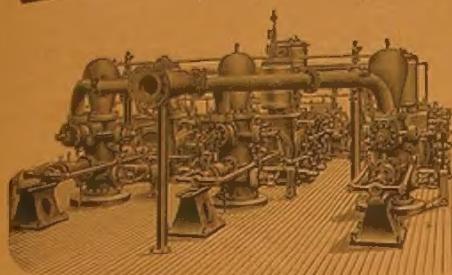


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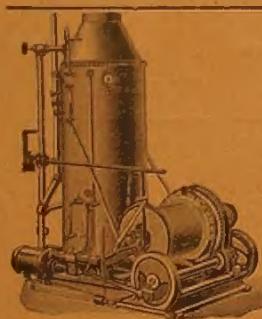
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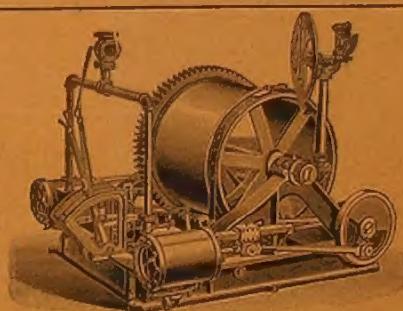
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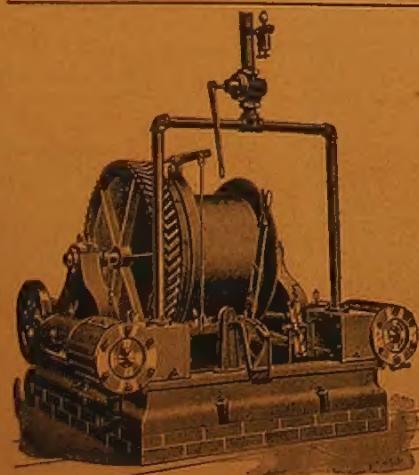
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